Poster display

1 - Basic Research

0011
Radiographic Screening of Scoliosis: Prevalence Study in Young Korean Military Recruits

T Ha, K Chang, J Hur

Incheon regional Military Manpower Administration, Korea.

Purpose: To assess the prevalence of scoliosis among young male recruited by the Military Manpower Administration in Korea.

Methods: A retrospective cross-sectional study was performed by analyzing chest radiograph taken from all young male recruits in Incheon Regional Military Manpower Administration from April, 1, 2011 to Mar 31, 2013. A thoraco-lumbar standing anterior-posterior radiograph was taken when suspected scoliosis in chest radiograph. More than 10 degree Cobb angle in thoraco-lumbar standing anterior-posterior radiograph was diagnosed as scoliosis.

Results: Total 80509 chest radiographs were taken. Among of them, 1671 thoraco-lumbar standing anterior-posterior radiographs were taken for confirming scoliosis. Diagnosed as scoliosis was 795. It was categorized according to cobb angle that consist of 652 (10~25 degree), 122 (25~40 degree) and 21 (> 40 degree). Each of them was 82.0%, 15.3%,2.7% in total scoliosis.Mean cobb angle is 20.5 degree±8.0.

Conclusion: In young Korean male military recruits, the overall prevalence of scoliosis was 0.98%, which was relatively lower than another recent studies.

0147
Radiation Dose Reduction to the Critical Organ with Bismuth Shielding During Endovascular Coil Embolizationfor Cerebral Aneurysms

Kwon Soonchan, Shin Shang Hun

Ulsan University Hospital, Korea.

Objective: This study evaluated certified dose reduction with bismuth shielding during an endovascular coiling procedure for cerebral aneurysms using a thermoluminescent dosimeter (TLD)-100H.

Materials and Methods: A total of 60 patients were enrolled in the study and randomized into two groups (shielding group, unshielded group).

Results: In the unshielded group, the total dose-area product (DAP) was 286.46 Gy•cm^2, the fluoroscopy time was 61.57 min, and the procedure time was 96.57 min. In the shielding group, those values were 256.36 Gy•cm^2, 51.10 min, and 91.00 min, respectively. The reductions in the organ-equivalent doses in the rt. eye, lt. eye, and thyroid were 32.9% (11.43 mSv), 28.9% (17.58 mSv), and 68.1% (20.48 mSv), respectively. The reductions in the relative organ doses were 21.6%, 20.8%, and 64.4%, respectively.

Conclusions: Bi shielding was feasible and effective for dose reduction during this neurointerventional procedure.

0165
Congenital Segmental Dolichoectasia of Distal Internal Carotid Artery with or without Proximal Posterior Cerebral Artery Involvement

LB Zhao[1], ES Park[3], DC Suh[2], DH Lee[2]

[1] Department of Radiology, First Affiliated Hospital of Nanjing Medical University,Nanjing, China. [2] Department of Radiology and Research Institute of Radiology,University of Ulsan College of Medicine,Asan Medical Center,Seoul, Korea. [3] Departments of Neurosurgery,University of Ulsan College of Medicine,Ulsan university hospital,Seoul, Korea, Korea.

Background and Purpose: Marked elongation and tortuosity of a certain segment of the cerebral arteries has been reported as part of the arterial abnormalities in PHACES syndrome. However, we could observe the peculiar abnormality in the distal internal carotid artery (ICA) in our non-PHACES syndrome patients. Some of the cases showed similar arterial abnormality at the proximal portion of the ipsilateral posterior cerebral artery (PCA).

Material and Methods: From our neurovascular database,12 patients were identified with congenital segmental dolichoectasia the distal ICA between 2005 and 2013. We retrospectively reviewed their medical records and images. Involved segments were identified according to the 7-segment concept of Lasjaunias et al. Morphologic changes of the PCA was noted.

Results: There were 9 women and 3 men, with a mean age of 41 years (range, 7 to 72 years). Clinical symptoms were various and 2 of them were incidental. Terminal segments of ICA are involved in all 5 (5/12, 42%) cases combined with ipsilateral posterior cerebral artery dolichoectasia. As to 6 (6/12, 50%) cases without posterior circulation involvement, only one case is presented with variation of terminal segment of ICA. The last case with proximal basilar trunk dolichoectasia is found combined with horizontal cavernous

segment of ICA abnormality. All patients had no cutaneous hemangioma.

Conclusion: Segmental marked elongation and tortuosity of the distal ICA which we coined as 'congenital segmental dolichoectasia' was frequently combined with similar angiographic change in the ipsilateral proximal PCA especially when the lesion involved terminal segment of the ICA.

0225
Salvageable Brain Tissue after Perfusion-Diffusion Match during Transient Focal Cerebral Ischemia in Non-human Primates

S-H Cha[1], SR Lee[2], HJ Lee[3], KS Yi[1]

[1] Chung Buk National University Hospital, Korea.
[2] National Primate Research Center, KRIBB, Korea.
[3] Chung Ang University College of Medicine, Korea.

Purpose: to report our observation of temporal evolution of experimental stroke and significant salvageable brain tissue after reperfusion even when the ischemic lesions reached perfusion-diffusion match.

Methods: In 5 rhesus monkeys, right MCAO were endovascularly achieved under the general anesthesia. Immediately after arterial occlusion, MCAO was maintained and each animal was repeatedly imaged with 3 Tesla MRI. Perfusion MRI was tried before and after the reperfusion. Patency of the right MCA was confirmed on follow up MRA. The temporal evolution of lesion volume and apparent diffusion coefficient (ADC) in the ischemic lesions were investigated.

Results: The duration of arterial occlusion was 50, 80, 100, 150, 200minutes, respectively. Focal infarction volume was, initially 35.5%, 11.1%, 8.7%, 13.7%, 13.1% of ipsilateral hemisphere (average = 16.4 %), peak volume prior to recanalization was 35.8%, 12.4%, 14.7%, 19.1%, 15.8% (average = 19.6%), respectively. After the reperfusion, lesion volume decreased to 21.1%, 8.9%, 1.9%, 11.1%, 15.1% (average = 11.6%) at 6 hour. ADC values in penumbra and core showed the differences initially after MCAO, gradually converged. At the peak of abnormal ADC volume prior to reperfusion, ADC measurements were similar in both areas and there was no perfusion-diffusion mismatch in the ischemic lesion.

Conclusion: In NHPs, we induced transient focal cerebral ischemia, and observed perfusion-diffusion match (or near-match) and homogenous ADC abnormality in the lesions during the course of experimental stroke. Salvageable brain tissue could exist even after perfusion-diffusion match (near-match).

0239
A Modified Canine Side-Wall Aneurysm Model Designedfor Testing of Intra-Luminal and Intra-Saccular Flow Diverters

D Consigny, D Niemann, C Strother

University Wisconsin, School of Medicine and Public Health, United States of America.

Purpose: Our goal was to create a side-wall canine aneurysm model having higher flow and more robust flow dynamics than the conventional side-wall model.

Materials and Methods: All procedures were performed under an institutional approved protocol. Vein patch aneurysms were created as has been previously described in detail for construction of terminal aneurysms1 except the vein patch was offset 2-3 mm. to the right side of the anastomosis of the proximal RCCA with the junction of the connected distal LCCA and RCCA.

Results: 24 aneurysms were created with the size ranging between 5 and 12 mm. in the greatest dimension. Over a period of 5.5 weeks between aneurysm creation and angiographic evaluation 2 partial thrombosis occurred. Angiography done at 30fps revealed a distinct flow jet entering the left side of the aneurysm pouch (the side closest to the proximal RCCA). Flow in these aneurysms was intermediate between the sluggish flow typical of sidewall aneurysms and the hyperdynamic flow seen in the bifurcation and terminal aneurysm models.

Conclusion: The modified side-wall model has more robust flow than does that of the conventional model. This may enhance its value in the evaluation of flow diverters.

Reference:

1 Graves VB, Ahuja A, Strother CM, et al. Canine model of terminal arterial aneurysm. Am J Neuroradiol. 1993; 14 (4): 801-803.

0252
In-Vitro Testing of Modern Hybrid and Established Carotid Stents

C Wissgott[1], W Schmidt[2], P Behrens[2], C Brandt[2], KP Schmitz[2], R Andresen[1]

[1] Institute for Diagnostic and Interventional Radiology / Neuroradiology, Westküstenklinikum Heide - Academic Teaching Hospital of the Universities of Kiel, Lübeck and Hamburg, Germany. [2] Institute for Biomedical Engineering, University of Rostock, Germany.

Objective: In vitro parameters such as radial force, flexibility and wall adaptation of different stents were investigated in order to obtain evidence for clinical use.

Material and Methods: A total of 8 current stent systems (Sinus Carotid RX, Cristallo Ideale, Adapt, Carotid Wallstent, Vivexx Carotid Stent, Xact Carotid Stent, Protégé Rx and Precise) with a diameter of 8 mm and a length of 40 mm were investigated. The radial force on expansion, the flexural rigidity of the stents, as well as the collapse pressure were measured. The wall adjustment of the expanded stents was documented by fluoroscopy in a step and curve model.

Results: The flexural rigidity of the stent systems declined significantly in the expanded state, whereby the Xact Carotid stent showed the highest value (291.1 Nmm^2) in contrast to 31.6 to 39.0 Nmm^2 for the Sinus and Cristallo. The radial force was lowest in the Adapt (0.009 N/mm) and highest in the Precise (0.068 N/mm), while the hybrid stents achieved values of between 0.027 and 0.046 N/mm. The collapse pressure was highest in the Carotid Wallstent (0.48 bar), compared with the other stents (0.1 – 0.2 bar). The best wall adjustment in the curve model was shown by the Precise, the Sinus

and Vivexx. The diameter change from 5 to 7 mm was smoothly adapted by Cristallo and Carotid Wallstent.

Conclusion: As a result of their design the hybrid-stents show the best wall adjustment, with comparable radial force and high flexibility, and thus can also be used in the case of an axis-deviant vascular course with variations in vessel diameter, whereby the Cristallo Ideale has the advantage that it has a "closed-cell" design in the middle third of the stent.

0276
Scalable Opencl Accelerated Multi-GPU Projection for Cone Beam Computed Tomography with a Highly Accurate Separable Footprint Method

R Frysch, T Pfeiffer, G Rose

Otto von Guericke University Magdeburg, Germany.

Many applications in X-ray imaging, especially iterative reconstruction for computed tomography (CT), require fast and accurate forward projections of 3D volumes. In this study we present an implementation of a highly accurate voxel-based footprint method for cone beam CT (CBCT). The vast computational effort is compensated by means of efficient approximations as well as massively parallel GPU programming. As a trade-off between accuracy and computation speed we use the separable trapezoid approach by Y. Long et al. (IEEE Trans Med Imaging, 2010). Our implementation focuses on using shared memory to quickly compute disjoint detector parts in parallel. Simultaneous read-write accesses within such a sector are handled using atomic functions which are part of the OpenCL 1.1 programming language used. The proposed routine transfers a large amount of the computational load to all available GPU hardware while direct communication between single devices is not required. As a consequence the computational time scales well with additional devices. The proper functionality is evaluated within an iterative statistical reconstruction algorithm. A typical volume for CBCT of 25×25×25 cm^3 (512^3 voxels) can be projected in less than 300 ms per view with a resolution of 616x480 pixels. Those *Results:* demonstrate that the proposed method is a valid alternative to the common ray-based projectors. With respect to this properties our approach is well suited for the demanding CBCT applications (e.g. perfusion imaging), which benefit from iterative reconstructions due to its sparsity and poor quality of the measured flat-panel data.

0318
Micro-Angioanatomy of the Proximal Segment of the Ophthalmic Artery and Its Choroidal Distribution: a Superselective Angiographic Correlation

A Aguado[1], M Acuña[2], EA Vazquez[1], N Florenzano[2], F Villasante[1], A Fandiño[3], A Ceciliano[1]

[1] Hospital Alemán - Ciudad de Buenos Aires / Hospital Universitario Austral - Pilar Buenos Aires, Argentina. [2] Instituto de Morfología J.J Naón - Unidad de Neurociencias - Facultad de Medicina, Universidad de Buenos Aires (UBA), Argentina. [3] Hospital Nacional de Pediatría Juan P. Garrahan - Ciudad de Buenos Aires, Argentina.

Objective: Describe and illustrate relevant aspects of the vascular microanatomy of the proximal segment of the ophthalmic artery (OA), choroidal vasculature and show the angiographic correlation.

Material and Method: We used formolized human cadavers injected with colored silicones to visualize vascular structures. Orbital region was dissected with microsurgical techniques and photographed at progressive stages. We reviewed 200 superselective angiographies which included direct catheterization of OA. We analyzed and correlated the material obtained.

Results: The AO becomes subarachnoid, crossing the roof of the cavernous sinus. It usually arises from the anterior curve of the internal carotid artery, which is located medial to the anterior clinoid process and gets into the optic canal. Rarely can it have an intracavernous origin or arise from a subarachnoid or intracavernous branch or from the middle meningeal artery. When the AO curves, it crosses over the nerve where the central retinal artery arises. Unusual origin could it be from the lacrimal artery; or a common trunk ciliary artery; or from the artery to the superior rectus muscle; or from the long right ciliary artery.

The musculars, the tear and ciliary arteries have its origin in the two first portions of the AO. The ciliary arteries supply the choroidal crescent and produce a characteristic concave angiographic blush in the lateral projection.

*Conclusion:*Accurate knowledge of the micro-angioanatomy of the ophthalmic artery reduce radiation time, allows right selection of microcatheter and prevent complications. These aspects are essential to perform successfully any ofthalmic superselective endovascular procedure.

0343
Human Embryonic Posterior Fossa Venous Development Based on Serial Histologic 3D Reconstruction

R Tonnelet[1,2], M Labrousse[1], MA Ottenin[2], E Micard[1,3], S Bracard[1,2,3], M Braun[1,2,3]

[1] Université de Lorraine, France. [2] CHU Nancy, France. [3] INSERM U 947, France.

Purpose: Since the mid 1950's, very little work has been done to contribute to a better understanding of venous vasculature developpement during embryogenesis. We present a new analysis *Method:* with multiplanar reformation process based on histologic sections. This presentation focus on the brain stem arachnoidopial venous anastomoses and torcular evolutive morphology.

Material and Methods: High resolution numerised microscopic continuous sections (10 to 20 µ) from Carnegie stage XIX to XXIII human embryo were used. Specific image treatment was the following: binarisation- thresholding-labellisation, rigid shifting, median filtration (resolution 10 µm/pixel); DICOM format images (1000 to 4000) are exported for post-treatment.

Angiographic rendering was obtained thanks to the Eosine/hematoxylin red cell fixation within the vessels.

Results: At first step, we confirmed the embryonic status relatively to the Carnegie classification in assessing the cochlear canal orientation. The evolutive morphology of the brain stem primitive venous network is presented ; at stage XIX, the initial longitudinal veins are separated from the caudal plexus. During the next stages, we demonstrate how they connected to transverse pial anastomoses. The next period (i.e the late embryonic and early post-embryonic period) shows these intrinsic pial veins lying between the arteries and the brain surface leading to a progressive simplication pattern. We also show the embryonic pattern of the torcular region for the same stages. These organisations are compared to the Padget and Streeter works.

0502
Interventional Radiology Role in the Management of Head and Neck Vascular Tumors

B Lander, M Garcia, A Alonso, A Guimarães, M Alvarado

Venezuelan Central University - Caracas University Hospital, Venezuela.

Purpose: To present the *Results:* of our experience in the percutaneous treatment of head and neck vascular tumors.

Materials and Methods: Retrospective study. Fourteen (n=14) patients (10 male, 4 female), mean age 33,5 years old, who underwent percutaneous treatment at the Neurointerventional Unit at Caracas University Hospital and Caracas Medical Center between July 2004 and July 2013, were included. Tumor histology and main blood supply, procedure indication, embolization agent, number of sessions, *Results:* and complications were assessed.

Results: 3 juvenile angiofibromas (21,4%%), 2 meningiomas (14,2%), 1 carotid Glomus (7,1%), 1 maxillary sinus adenocarcinoma, 1 recurrent leiomyosarcoma, 1 fibrosarcoma, 1 osteoblastoma and 4 other tumors (28,5%) with main blood supply from internal maxillary (64,2%), occipital (14,2%) and superficial temporal (14,2%) arteries were treated. 100% of the procedures were performed as preoperative adjuvant therapy through exclusive percutaneous approach in 6 cases (42,8%) and both percutaneous and endovascular approach in 8 cases (57,1%). Embolization agents used were Cianocrilate in 71,4% (10), ethylene vinyl alcohol copolymer in 28,5% (4), Absolute Ethanol in 28,5% (4) and Absorbable Gelatin in 21,4% (3). 71,4% of the patients underwent embolization once (10), 21,4% twice (3) and 7,14% three times (1) with no complications reported. Intra-operative bleeding was significantly reduced with higher total resection rate associated. 2 post-operative tumor relapse occurred (14,2%).

Conclusions: Preoperative percutaneous embolization *Results:* a useful, effective and safe contribution to the multidisciplinary management of vascular head and neck tumors.

0559
Anatomical and Embryological Influence in the Development of Posterior Superior Basilar Complex Aneurysms

E Fürst, S Garbugino, LA Lemme Plaghos

Centro Endovascular Neurológico Buenos Aires, Argentina.

Objectives: Identification of perforating arteries and prospective view on aneurysms development of the Posterior Superior Basilar Complex (PSBC), in relation to its conformational variant.

Introduction: Because anatomical and embryological origin of the Posterior Superior Basilar Complex (P1 segments of the Posterior Cerebral Arteries, distal Basilar Artery and Superior Cerebellar Artery) is different from the rest of the Circle of Willis, we believe that aneurysms located there must be studied and interpreted as an isolated subgroup.

Material and Methods: We analyzed retrospectively 50 angiograms with PSBC aneurysms treated by endovascular procedure, and a randomized control group composed by 50 cases of CBPS free of pathology.

Discussion: The PSBC fusion consists in the union of the embryological Carotid Internal Arteries with the Anterior Longitudinal Neural Arteries. The moment when it melts determines different configurations: Cranial and Symmetrical, Caudal and Symmetrical, and Caudal and Partial.

*Conclusion:*The 80% of PSBC aneurysms corresponded to the Caudal variety, versus 56% on the disease-free control group. This difference was predominantly because of the basilar tip aneurysms, where the 90.6% had such configuration , being predominantly partial (asymmetric).

2 - Vascular Neuro Imaging Developments

0021
Evaluation of Usability of Neuro PBV Imaging by C-Arm CT During Carotid Artery Stenting

M Fujimoto

Kasai Shoikai Hospital, Japan.

Purpose: Postoperative hyperperfusion syndrome is a serious complication accompanying carotid artery stenting (CAS). Generally, in comparison with CEA, symptoms of hyperperfusion syndrome appear at an earlier postoperative period. Consequently, early evaluation of cerebral perfusion is required. Since 2011, measurement of cerebral blood volume (CBV) has been carried out at our hospital, using Neuro parenchimal blood volume (Neuro PBV), which uses a cerebral angiography device equipped with a C-arm CT to produce images. CBV was evaluated by Neuro PBV before and after CAS, and usability was considered.

Subjects and Method: 25 cases of CAS performed on carotid artery stenosis were targeted, and evaluation was conducted by Neuro PBV at this hospital since January 2011. CBV was measured by Neuro PBV during preoperative and postoperative angiography, and the affected side, before and after operation, was comparatively examined against the unaffected side.

Results: Immediately after operation, increased CBV was observed on the affected side in 18 cases. In 2 cases where CBV significantly increased on the affected side, hyperperfusion syndrome followed, and intracerebral hemorrhage occurred.

*Conclusion:*Immediately after CAS, a tendency of increased CBV was observed. When the rate of increase is significant on the affected side, hyperperfusion syndrome may occur. Therefore, measurement of CBV using Neuro PBV is considered to be useful in postoperative management.

0118
Patient Radiation Dose in Diagnostic and Therapeutic Neurointerventional Procedures of the Intracranial Aneurysm

B Kim, JE Park, SY Oh, YS Shin

Seoul St.Mary's Hospital, The Catholic University of Korea, Korea.

Purpose: To report patient radiation dose during cerebral angiography and embolization of intracranial aneurysms in a large sample size from single center.

Materials and Methods: For the reference analysis, we studied a sample of 439 diagnostic and 149 therapeutic procedures for intracranial aneurysm in 480 patients (331 female, 149 male; median age, 57 years; range, 21-88 years), which were performed in year 2012 with biplane unit. Parameters including fluoroscopic time, dose-area-product (DAP) and total image frames were analysed.

Results: Mean fluoroscopic time, total mean DAP and total image frames were 12.6 min, 136.6 ± 44.8 Gy-cm^2, and 251 ± 49 frames for diagnostic procedure, 52.9 min, 226.0 ± 129.2 Gy-cm^2, 241 frames for therapeutic procedure, and 52.2 min, 334.5 ± 184.6 Gy-cm^2, and 408 frames for both procedures at a same session. Proportion of fluoroscopic DAP in the procedure was 11.4% for diagnostic only, 50.5% for therapeutic only, and 36.1% for both at the same session, respectively. In overall, mean DAP was 0.376 ± 0.125 Gy-cm^2 per image frame, and mean fluoroscopic DAP was 1.467 ± 0.623 Gy-cm^2 per minute. Mean DAP for each 3D rotational angiographic acquisition was 19.2 ± 3.2 Gy-cm^2.

Conclusion: The complexity of the diagnostic and therapeutic procedure for intracranial aneurysm is responsible for high radiation dose to the patient, with higher proportion of fluoroscopic DAP in therapeutic procedure.

0174
Vessel Sacrifice Using Coil-Assisted Onyx Injection in a Patient with Carotid Blow-Out Syndrome

A Traore, GL Horn, G Benndorf

Baylor College of Medicine, United States of America.

Purpose: Carotid blowout syndrome (CBS) is a potentially disastrous complication of radiation therapy and surgery. Endovascular management is the preferred treatment and often must be performed emergently. We describe a case of CBS with successful treatment by parent artery occlusion (PAO).

Material and Methods: An unresponsive 27-year-old female with prior chemoradiation for sarcoma of the nasopharynx presented with profuse epistaxis. She was brought to the ER tachycardic and hypotensive. Nasal packing and Foley catheters established initial hemostasis. Blood loss was greater than 1 L. During the CT, the patient had an episode of hemorrhage, became hypotensive, and was intubated. Shortly afterwards, no pulse was palpated, and CPR was initiated. CTA suggested complete occlusion of the cervical segment of the right internal carotid artery (ICA) with extravasation.

Results: The patient was transferred to Neuro-IR and cerebral angiography revealed a long, narrowed but patent right cervical ICA with a pseudoaneurysm. There was cross-flow filling of the right MCA. A guiding catheter was advanced into the right ICA, and a microcatheter was navigated through the narrowed carotid lumen into the petrous ICA. Coils were deployed, and liquid embolic agent was injected occluding the cervical ICA and pseudoaneurysm. The patient fully recovered and at 6-months was radiographically stable and neurologically intact.

Conclusion: In a patient with CBS, angiography is superior to CTA to detect a bleeding site and assess cerebral circulation. If the angiogram shows a functioning Circle of Willis, PAO can be performed without balloon test occlusion as a fast, efficient and life-saving procedure.

0227
Intermittent Flushing Versus Continuous Infusion Of Heparinized Saline In Transfemoral Cerebral Angiography

HJ Kim[1], HJ Lee[2], SB Lee[3], PS Yang[1], JH Yang[2], JS Yi[2], IW Lee[2], S Ryu[3], TW Kim[3]

[1] Department of Radiology, Daejeon St. Mary's Hospital, The Catholic University of Korea, Korea. [2] Department of Neurosurgery, Daejeon St. Mary's Hospital, The Catholic University of Korea, Korea. [3] Department of Neurology, Daejeon St. Mary's Hospital, The Catholic University of Korea, Korea.

Purpose: Flushing of heparinized saline is mandatory in transfemoral cerebral angiography and is being done intermittently or continuously according to the interventionist's preference. Our aim was to evaluate the effect of these two flushing methods in transfemoral cerebral angiography.

Methods: Twenty patients (13 women, 7 men; age range, 42 to 66 years, mean, 53 years) were prospectively enrolled in the present study. The transfemoral cerebral angiography was done by using one of two flushing methods of heparinized saline: intermittent (group 1) or continuous infusion (group 2), by block randomization method.

Result: Nine patients were included in group1 and 11 patients in group 2. The procedure time between two groups was not different even though the preparation time for flushing of heparinized saline was significantly longer in group 2.

The amount of injected contrast material (mean, 59.6 ml vs 19.6 ml), lost contrast material (mean, 28.0 ml vs 5.4 ml), lost saline (mean, 98.1 ml vs 20.2 ml), and lost blood (mean, 15.3 ml vs 4.0 ml) were significantly lesser in group 2 than group 1 (P= .000). The amount of injected saline into body and infused amount of heparin, the fluoro time and radiation dose were not significantly different between two groups.

Conclusion: The continuous flushing *Method:* is better for reducing the amount of injected and lost contrast material, lost saline and lost blood without prolongation of procedure time and increase of radiation dose than the intermittent flushing method in transfemoral cerebral angiography.

0417
Spinal Vascular Anatomy With Partial Maximum Intensity Projection Images Taken by Three Dimensional Rotational Angiography and Cone-Beam CT

Y Matsumaru, M Sato, T Amano, K Mori, Y Hamada

Department of Endovascular Neurosurgery, Toranomon Hospital, Japan.

Purpose: This study aims to clarify the role of partial maximum intensity projection (PMIP) images taken by three dimensional rotational angiography (3DRA) and cone-beam CT (CBCT) for spinal vascular diseases.

Material and Methods: We retrospectively analyzed 11 patients who had spinal angiography due to spinal dural arteriovenous fistulas (n=3), spinal cord arteriovenous fistulas or malformations (n=5) and cavernous malformation or other suspected vascular lesion (n=3) at Toranomon Hospital between 2011 and 2013. Conventional spinal digital subtraction angiography (DSA) images were compared with PMIP images taken by 3DRA and CBCT using a biplane flat-panel angiography system (Allura Xper FD20/20; Philips Healthcare, Best, the Netherlands). All procedures were performed under general anesthesia.

Results: There were no complications related to the spinal angiography. PMIP images of 3DRA clearly showed major arterial anatomy such as anterior and posterior spinal artery and arterial basket with optionally size of FOV. PMIP images of CBCT could demonstrate smaller vessels such as sulcal artery and vasa corona in smaller FOV with spinal veins due to long acquisition time. Moreover, CBCT clearly showed fistulas point with the difference of contrast density. Fusion of these images such as 3DRA and CBCT enables to understand complex vascular anatomy.

*Conclusion:*PMIP images taken by 3DRA and CBCT are helpful to understand complex vascular anatomy and to plan the treatment for spinal vascular diseases.

0495
Double Ophthalmic Artery Origin from the Carotid Siphon

R Rivera, R Riveros, P Giacaman, JG Sordo, E Bravo, L Badilla

Instituto de Neurocirugia Asenjo, Chile.

Purpose: We present two cases of double origin of the ophthalmic artery from the carotid siphon in patients with cerebral aneurysms studied with angiography.

Method: We found two cases in 13014 cerebral angiographies from January 1997 until April 2013.

Results: Case 1: 43 year old man with a history of aneurysmal subarachnoid hemorrhage from ruptured anterior communicating artery which was clipped and evolved with vasospasm; angiography and combined angioplasty was performed.

Case 2: A 49-year female with left carotid ophthalmic artery unruptured aneurysm treated with coils. Both patients have a double origin of the ophthalmic artery with a dorsal component emerging from the cavernous segment, which enters to the orbit through the superior orbital fissure and a ventral component emerging from ophthalmic segment and enters the orbit through the optical channel.

This variant corresponds to a persistence and lack of regression of the early embryonic stage of the ophthalmic artery development.

Conclusion: The dual origin of the ophthalmic artery is a rare variant and corresponds to a persistence of the embryonic period.

0515
Development of Remote Medical Service System and Neurovascular Treatment Planning Using Smartphone

BT Kim

Neurosurgery, Soonchunhyang University Bucheon Hospital,, Korea.

Background: Telemedicine is the specialty of medicine that uses the evolving telecommunications industry combined with medical information technology to provide remote medical services. The use of smartphone telemedicine is an efficient and effective way for remote specialist consultation and should be considered by the neurovascular surgeon.

Method: The Groupware system has been setup on the hospital computer server. The software engine has been developed for the use of smartphone. Through the remote medical service system, the core information of the patient's database can be displayed for the physician with his ID and password.

Result: Smartphones provide fast and clear access to the patient's laboratory information and to electronically digital images and allows the neurovascular surgeon free mobility, not restricted by the constraints of a desktop personal computer.

CT and 3 dimensional angiographic images have been showing clearly and the treatment planning can be decided on the remote site with smartphone. Case illustration will be presented.

Conclusion: This allows for improved efficiency of the specialty consultation to the neurovascular treatment and improved care to the stroke patients especially in the emergent situation.

3 - Cerebral Ischaemic Disease

0017
Mechanical Thrombectomy Using a Solitaire Stent : Experience in 14 Patients with Acute Cerebral Artery Occlusion(Poster Presentation)

TS Gong

Department of Neurosurgery,Presbyterian Medical Center,Jeonju,Korea, Korea.

Objective: This study was conducted in order to demonstrate the initial experience of the Solitaire stent in mechanical intracranial thrombectomy

Methods: We conducted a retrospective review of 14 consecutive patients who underwent intra-arterial Solitaire stent thrombectomy for treatment of acute cerebral artery occlusion, between July 2010 and February 2013. Demographic, clinical, and radiological presentations and outcomes were studied.

Results: Five men and nine women with a mean GCS score of 11.7 (range, 8-14) and a mean age of 70.8 (range, 49-84) years were included in this study. Occlusion site were as follows: Internal carotid artery (n=1), middle cerebral artery M1 (n=10), M2 (n=1), posterior cerebral artery (n=1), and basilar artery (n=1). Successful recanalization was achieved with Solitaire thrombectomy in 11 patient. The mean GCS score was 8.4 (range, 3-15). Post-procedural intracerebral hemorrhage occurred in three cases.

Conclusion: : Mechanical thrombectomy by using the Solitaire stent is a relatively safe and capable of achieving a high rate of recanalization (78.6%) in patients with acute cerebral artery occlusion.

0018
Multiple Emboli Captured of Cerebral Protection with Filter Device During Carotid Artery Stenting: Two Cases Report (Poster Presentation)

TS Gong

Department of Neurosurgery,Presbyterian Medical Center,Jeonju,Korea, Korea.

Carotid artery stenting (CAS) has rapidly grown as an alternative to carotid endarterectomy for stroke prevention among selected patients with extracarnial carotid artery stenosis. Since the occurrence of distal embolization with CAS is still a major concern, an embolic protection device (EPD) is usually employed during procedure. Development of mechanical embolic protection device has been associated with improved clinical outcomes and is now a strongly advocated adjunct to the procedure. We reported two patients with Large multiple emboli captured of Cerebral protection with filter device during carotid artery stenting. The immediate cranial and carotid angiogram showed a good result with regular patency of carotid and cerebral vessels.and large plaque captured by filter device. Embolic protection device is safe and effective for captured plaque undergoing CAS.

0020
Association of Cerebrovascular Plaques with Cerebral Microbleeds and Cerebrovascular Ischemic Events

DW Park, YJ Lee, CK Park

Hanyang University Medical School, Korea.

Purpose: The purpose of this study is to evaluate the correlation of cerebrovascular plaque characters, the presence of cerebral microbleeds (CMBs) and cerebrovascular ischemic (CVI) events.

Materials and Methods: Thirty five consecutive patients (18 men; 17 women; mean age, 62.1 years) underwent vessel wall MRI studies including high resolution T1-, T2-, Proton density, and contrast-enhanced T1-weighted images and MR angiography for cerebrovascular plaque at 3T. CMBs were studied using T2*-weighted GRE sequences and/or susceptibility weighted images. Plaques are characterized based on their composition. Intraplaque hemorrhage (IPH) and adventitial enhancement (AE) are categorized by T1 and T2 hyperintensity and contrast enhancement. Patients are classified with recent CVI events.

Results: IPH and AE are present in 29% and 82% of patients, which are associated with recent CVI events (P value<0.05). The prevalence of CMBs is 21%, which is significantly higher in the patients with recent CVI events (P value < 0.05). A statistically significant association is observed between the presences of IPH, AE and CMBs (P value < 0.05). Correlation analysis demonstrates an association between the number of CMBs and the recent CVI events (P value < 0.05).

Conclusion: In conclusion, there are an association between the presence of IPH, AE, CMBs and recent CVI events. The presence of CMBs may represent an indicator of cerebrovascular symptom severity.

0045
Clinical Significance of Perfusion/Diffusion Mismatching in Additional Intraarterial Thrombolytic Therapy after Full Dose i.v.-TPA Administration

KU Young-Mi, WON Yoodong

Uijongbu St. Mary's Hospital Stroke Center, The Catholic University of Korea, College of Medicine, Korea.

Intravenous administration of tissue plasminogen activator (i.v.-tPA) is accepted as a standard treatment for acute cerebral ischemia, but the clinical outcomes cannot be warranted in patients who are not recanalized after i.v. tPA or who not indicated for i.v.-tPA. Presently, outcomes from the use of the additional intra-arterial thrombolytic therapy in these patient groups were compared to assess whether i.v. tPA administration is advantageous or dangerous. Sixty-three patients were divided into a tPA group (n=29, intra-arterial thrombolysis after i.v. tPA) and non-tPA group (n=34, intra-arterial therombolysis without i.v. tPA). These groups were subdivided according to matched or mismatched diffusion/perfusion weighted imaging (DWI/PWI) upon MR imaging. Treatment *Results:* were compared by recanalization rate, clinical outcomes, mortality, and significant intracerebral hemorrhage rate. Recanalization rate was 79.3% in the tPA group and 55.9% in the non-tPA group. Favorable outcome, mortality and significant intracerebral hemorrhage were not statistically significantly different in the two groups. Subgroup analysis between DWI/PWI mismatched in tPA group and non-tPA group showed no statistical difference in recanalization rate, favorable clinical outcome, and mortality but significant intracerebral hemorrhage rate was high in tPA group. In conclusion, additional intra-arterial thrombolytic treatment after full dose i.v. tPA administration might be an acceptable treatment option for the patients with DWI/PWI mismatching. And for the patients who are not indicated for i.v. tPA, DWI/PWI mismatching was also good prognostic indicator for the intra-arterial thrombolysis.

0052
Autopsy Proven Mucor Infection in a Young Man as a Cause of Acute Arterial Dissection, a Case Report and Review Literatures

Chai Kobkitsuksakul[3], N Larbcharoensub[2], C Suriyonplengsaeng[4], E Chanthanaphak[3], P Jiarakongmun[3], S Pongpech[3]

[2] Department of Pathology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand. [3] Department of Radiology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand. [4] Department of Anatomy, Faculty of Science, Mahidol University, Thailand.

Purpose, Material and Methods: To review clinical, imaging, autopsy and literatures results of infective arterial dissection of a young Asian man who presents with acute lacunar infarction following with acute subarachnoid hemorrhage and acute PCA infarction in a day later.

Major findings: A 36 year old man, unknown underlying disease, presented with headache for a week which can be palliated by over the counter medication. He developed fever particularly at night in two days later on without other organ specific symptom except headache that became worse. Two days later during working, he had sudden left sided weakness. Non invasive image revealed a lacunar infarction at the right thalamus. A day later, after first diagnosed DM, he developed generalized tonic-clonic seizure and deteriorated consciousness.The CTA of the brain showed diffuse SAH, ventricular hemorrhage and hydrocephalus. Also there was acute right temporo-occipital lobes infarction accounting for right posterior cerebral artery (PCA) territory distribution. The angiogram was done and showed immediate abruption of the right P1 just 2-mm from the P1-basilar junction.The provisional diagnosis was acute arterial dissection.While the empirical treatment was giving, the cause of intracranial dissection was worked up. Nonetheless, the patient ran down quickly and passed away 96 hours later.The autopsy was done and the histology revealed mucor family deposition in the arterial wall accounting for this injured artery.

Conclusion: intracranial arterial dissection usually presents with stroke or hemorrhage in the young age. One must search for the predisposing factor that include the infection giving prompt treatment.

0062
Carotid Artery Stenting for Treatment of Carotid Stenosis with Cerebral Hemodynamic Compromise

T Ogino, T Kataoka, H Endo, K Takahira, K Kamiyama, H Nakamura

Department of Neurosurgery, Nakamura Memorial Hospital, Japan.

Purpose: We reviewed the treatment *Results:* of cervical carotid artery stenting (CAS) for carotid stenosis with cerebral hemodynamic compromise evaluated by 123I-IMP single photon emission computed tomography (SPECT).

Materials and Methods: We treated 12 cases of carotid stenosis with stage II hemodynamic cerebral ischemia. Hemodynamic compromise was diagnosed by pre-treatment resting and acetazolamide-activated CBF-SPECT using 123I-IMP. There were 6 cases of symptomatic and 6 cases of asymptomatic carotid stenosis. Post-treatment CBF was evaluated 7 days after the procedure.

Results: In all cases pre-operative stage II hemodynamic compromise was improved at post-procedure SPECT. There were no cases of hyperperfusion syndrome (HPS), intracerebral hemorrhage or ischemic complications during and post the procedure.

Conclusion: In patient with ipsilateral stage II cerebral ischemia, the peri-operative countermeasure against HPS is very important. And in patient with contralateral side stage II cerebral ischemia, it is necessary to consider how to cope with bradycardia and hypotension to prevent peri-procedural cerebral infarction.

0109
Ophthalmic Artery Flow Before and after Carotid Artery Stenting

K Sato[1], M Hayashi[1], T Yokouchi[2], H Kimura[1], K Aoki[1], N Saito[1], H Nakayama[1], J Harashina[1], J Iwama[1], M Ishii[1], M Utsunomiya[3], Y Iizuka[4], S Iwabuchi[1]

[1] Department of Neurosurgery, Toho University Ohashi Medical Center, Japan. [2] Department of Neurosurgery, Yokohama General Hospital, Japan. [3] Department of Cardiovascular internal medicine, Toho University Ohashi Medical Center, Japan. [4] Department of Radiology, Toho University Ohashi Medical Center, Japan.

Purposes: We evaluate the direction of ophthalmic artery flow (OPAF) on carotid angiography before and after carotid artery stenting (CAS). Patients and *Methods:* From April 2003 to January 2013, 130 patients with carotid artery stenosis underwent CAS in our hospital, and 76 patients were evaluated OPAF before and after CAS. Mean carotid artery stenosis rate measured by NASCET method was 71.2%, and mean peak systolic velocity (PSV) on carotid ultrasound examination was 384 cm/s. The patients were classified into 3 groups before and after CAS based on the direction of OPAF, ie, antegrade flow (group A), retrograde flow (group B), and unidentified (group C). The degree of carotid artery stenosis (NASCET method and PSV) in group A was statistically compared with that in the other groups.

Results: Before CAS, there were 43 patients (56.6%) in group A, 20 (26.3%) in group B, and 13 (17.1%) in group C. In analysis using the NASCET method and PSV, the severity of carotid artery stenosis was significantly greater in group B or C than in group A ($p<0.01$). After CAS, antegrade flow was noted in all patients in group A, in 19 of 20 patients in group B, and in 6 of 13 patients in group C.

Conclusions: Carotid artery stenosis was significantly more severe in patients without antegrade OPAF than in those with antegrade OPAF. Retrograde OPAF is a cause of ocular ischemic syndrome. Most of retrograde or unidentified OPAF before CAS changed to antegrade OPAF after CAS, which suggests that patients with severe carotid artery stenosis were successfully treated by CAS and that progression to ocular ischemic syndrome might be prevented.

0119
Utility Of Blade Fluid-Attenuated Inversion Recovery (Flair) Images in Hyperacute Territorial Infarction

Sm Lim, Je Park

Ewha Womans University Mokdong Hospital, Korea.

Purpose: The purpose of this study was to evaluate the utility of BLADE Fluid-attenuated inversion recovery (FLAIR) MR imaging compared with that of conventional FLAIR in cases of hyperacute territorial infarction.

Materials and Methods: We retrospectively analyzed the MR images including DWI, MRA, gradient images of patients with hyperacute (<6 hr) territorial infarction for 4 months. 32 patients (11 female, 21 male: mean age, 70 years) with middle cerebral arterial territory (n=26), and internal carotid arterial territory (n=6) infarctions were examined. Special attention was paid to the presence or absence of arterial hyperintensity (AH) and peripheral branches of AH and CSF artifacts on BLADE FLAIR and conventional FLAIR.Results: AH was found in 32 patients on BLADE FLAIR, 30 patients on conventional FLAIR. The peripheral branches of AH were more prominent and increased in number on BLADE FLAIR in all 32 patients. ($p=0.003$) The dark signal intensity of arterial thrombus on gradient images was found in 17 patients.

Conclusions: The BLADE FLAIR sequences were more conspicuous in detection of AH in hyperacute territorial infarction and may be used replace of conventional FLAIR in hyperacute stroke MR examinations.

0120
Critical Use of Balloon Angioplasty after Recanalization Failure with Retrievable Stent in Acute Cerebral Artery Occlusion

KS Jang, SK Park, DK Jang

Department of Neurosurgery, Incheon St. Mary's Hospital, The catholic university of Korea, Korea.

Objective: Sudden major cerebral artery occlusion often resists recanalization with currently available techniques or can results in massive symptomatic intracranial hemorrhage (sICH) after thrombolytic therapy. The purpose of this study was to examine mechanical recanalization with a retrievable self-expanding stent and balloon in acute intracranial artery occlusions.

Methods: Twenty-eight consecutive patients with acute intracranial artery occlusions were treated with a Solitaire retrievable stent. Balloon angioplasty was added if successful recanalization was not achieved after stent retrieval. The angiographic outcome was assessed by Thrombolysis in Cerebral Infarction (TICI) and the clinical outcomes were assessed by the National Institutes of Health Stroke Scale (NIHSS) and the modified Rankin Scale (mRS).

Results: : At baseline, mean age was 69.4 years and mean initial NIHSS score was 12.5. A recanalization to TICI 2 or 3 was achieved in 24 patients (85%) after stent retrieval. Successful recanalization was achieved after additional balloon angioplasty in 4 patients. At 90-day follow-up, 24 patients (85%) had a NIHSS improvement of ≥4 and 17 patients (60%) had a good outcome (mRS ≤2). Although there was sICH, there was one death associated with the procedure.

Conclusion: Mechanical thromboembolectomy with a retrievable stent followed by additional balloon angioplasty is a safe and effective first-line therapy for acute intracranial artery occlusions especially in case of unsuccessful recanalization after stent thrombectomy.

0123
Urgent Recanalization with Stent for Severe Intracranial Atherosclerosis in Patients with Transient Ischemic Attack or Minor Stroke

TH Lee[1], SK Baik[5], SM Sung[1], HW Jeong[2], BJ Choi[3], CH Kim[4]

[1] Pusan National University Hospital, Korea. [2] Inje University Busan Paik Hospital, Korea. [3] Pohang Stroke and Spinal Hospital, Korea. [4] Keimyung University Dongsan Medical Center, Korea. [5] Pusan National University Yangsan Hospital, Korea.

Background and Purpose: Stenting of symptomatic intracranial stenosis has recently become an alternative treatment modality. However, urgent intracranial stenting in patients with intracranial stenosis following a transient ischemic attack (TIA) or minor stroke is open to dispute. We sought to assess the feasibility, safety, and effectiveness of urgent intracranial stenting for severe stenosis (>70%) in TIA or minor stroke patients.

Methods: Between June 2009 and March 2012, stent-assisted angioplasty by using stent for intracranial severe stenosis (>70%) was performed in 11 patients after TIA (14 stenotic lesions) and 41 patients after minor stroke (42 stenotic lesions). Technical success rates, complications, angiographic findings, and clinical outcomes were retrospectively analyzed.

Results: Stenting was successful in all patients. The mean time interval from stroke symptom onset to stenting was 5.2 days (1~14 days). The mean pre-procedural stenosis was 84.7% (range 70-95%). Acute in-stent thrombosis occurred in two lesions (n = 2, 3.8%) and was lysed with abciximab. Procedure-related complications (n=2, 3.8%) were asymptomatic dissection (n=1) by balloon angioplasty and vessel perforation (n=1) by a microwire. Symptomatic subacute in-stent thrombosis occurred in one lesion (n = 1, 1.9%) at 7th post-stenting days and was solved by balloon angioplasty and stenting. At discharge, an mRS of ≤ 2 was achieved in all patients and an mRS of 0 was achieved in 43 patients (82.7%).

Conclusion: Urgent intracranial stenting for severe stenosis of ≥70% is feasible, safe, and effective in patients with TIA or acute minor stroke.

0149
Mechanical Thrombectomy Using Solitare Stent with Low Dose Booster Injection of Tirofiban

HW Jeong[1], SY Ha[2], SC Jin[3]

[1] Department of Diagnostic Radiology, Busan Paik Hospital, Inje University, Korea. [2] Department of Neurology, Haeundae Paik Hospital, Inje University, Korea. [3] Department of Neurosurgery, Haeundae Paik Hospital, Inje University, Korea.

Purpose: Mechanical thrombectomy using solitaire stent has been recent trends with high recanalization rate and favourable clinical outcome in intra-arterial thrombolysis. To achieve better recanalization rate in mechanical thrombectomy. We used intra-arterial low dose of tirofiban after stent deployment into the occluded segment. Herein, we report the safety and the recanalization rates in the mechanical thrombectomy using solitaire stent with low dose booster injection of tirofiban.

Material and Methods: Between February 2013 and March 2013, 13 consecutive patients underwent mechanical thrombectomy using solitaire stent with low dose intra-arterial tirofiban infusion. Occlusion site included proximal middle cerebral artery in 5 patients, internal carotid artery in 5, top of basilar in 2, and distal middle cerebral artery (M2 segment) in 1. 6 patients underwent bridge treatment including intravenous tPA. 250 mcg of tirofiban was used in all patients except one (500 mcg). All of occluded vessels recanalized within 3 times of stent retrieval (1 time, n=9; 2 times, n=2; 3 times, n=2).

Results: Recanalization were performed in all patients (TICI 3, n= 8; TICI 2b, n=5). Procedural complications developed in 3 patients (subarachnoid hemorrhage, n=2; hemorrhagic transformation, n=1). Mortality occurred in one patient with basilar top occlusion due to reperfusion brain swelling after mechanical thrombectomy. Favourable clinical outcome (mRS ≥2) was observed in 8 patients (61.5%).

Conclusion: These *Results:* suggest that low dose tirofiban infusion accelerates the recanalization rate in mechanical thrombectomy using solitaire stent with no additive hemorrhagic complication.

0156
Congenital Anomalies of Internal Carotid Artery and Compensatory Collateral Circulation-7 Case

Park Jung Eon, Kim Bum Soo, Shin Yong Sam, Oh Se Yang

Seoul St. Mary's Hospital, Korea.

Background: Congenital anomalies of internal carotid artery (ICA) are very rare and usually diagnosed in-

cindentally. Because abnormal lesions shown various types of compensatory collateral circulation by ways of circle of Willis, persistent embryonic vessels, and rete mirabile and so on. But sometimes some patients experience hemorrhagic or ischemic symptoms.

Patients and Methods: 7 cases of ICA agenesis are reviewd. Brain CT or magnetic resonance image were initial diagnostic tools. Two patients who complaint about ischemic symptoms were evaluated the brain SPECT. Cerebral angiogram was obtained in 5 patients.

Result: There were 4 in absent carotid canal on CT or MRI. 2 were narrowing of carotid canal, 1 for normal. 2 of 2 patiens who performed brain SPECT shown decreased activity at ipsilateral lesion. In 2 patients rete mirabile was found, other 4 patients with collateral circulation of circle of Willis, another one was ascending pharyngeal artery-ICA anastomosis and had concordant unruptured aneurysm.

Conclusion: There were various type of ICA congenital anomalies and different compensatory collateral circulations, concordant vascular abnormalities.

0172
Clinical Course of Spontaneous MCA Dissection and Feasibility of Stent Insertion

Lee Dong-Geun[1], Shim Jae Ho[1], Zhao Lin Bo[2], Suh Dae Chul[1], Lee Deok Hee[1]

[1] Asan Medical Center, Korea. [2] First Affiliated Hospital of Nanjing Medical University, China.

Introduction: MCA dissection is less frequent than dissection of vessels in the vertebrobasilar system or carotid artery. Most dissections of the anterior circulation are associated with cerebral ischemia and result in complete stroke because of arterial stenosis or occlusion. We report our experience of angiographically confirmed spontaneous MCA dissection focusing on the outcome.

Methods: Between 2002 and 2012, we could retrieve 23 patients who were diagnosed as having an 'MCA dissection' from our prospectively collected database. Two experienced neuroangiograhers reviewed both angiographic and cross-sectional imaging findings together with clinical pictures. Age, sex, presenting neurologic deficits and the presence of risk factors and supporting lab data were collected. Data of neurologic status were evaluated. We analyzed clinical outcome after various treatments.

Results: Of 23 cases, 9 were excluded (traumatic dissection: 1, no definitive feature of dissection: 8) leaving 14 patients and their mean age was 47.3yrs (M: F = 11:3). 11 cases revealed acute infarction on DWI. There was no hemorrhagic presentation. We treated them with antithrombotic agents only (n=7), stent insertion (n=6), or chemical thrombolysis (n=1). There was no technical complication. Conservative group had milder deficits than those treated with stenting group (mean NIHSS, 2.0 and 4.3, respectively). Mean NIHSS at discharge was also milder in conservative group than that of stenting group (0.6 and 2.6).

Conclusions: Our result indicates that spontaneous MCA dissection had relatively mild clinical course if treated properly. Self-expanding stent placement seemed feasible without additional safety issue.

0195
Staged Carotid Artery Stenting : Efficacy and Technical Consideration

EJ Kim[1], KM Lee[1], WS Choi[1], SK Choi[1], CW Ryu[2]

[1] Kyung Hee University Hospital, Korea. [2] Kyung Hee University Hospital at Gangdong, Korea.

Purpose: To investigate the efficacy and technical consideration of staged carotid artery stenting (S-CAS; performing carotid artery stenting some days after balloon angioplasty).

Material and Method: From January 2008 to May 2013, 27 patients (22 men, 5 women, mean 71.7 years old) of the total 352 cases of the CAS or balloon angioplasty for S-CAS were included. We retrospectively evaluate the success rate of S-CAS and the cause of non-performing S-CAS. We also evaluate the time interval between CAS and balloon angioplasty, and the post-stenting complications.

Result: Balloon angioplasty was successfully performed in all 27 patients. There was no periprocedural neurologic complication. Balloon angioplasty catheter with 3 mm in diameter were the most commonly used(17/27). Technical success of S-CAS was achieved in 74.1% (20 cases). Of the seven patients with non-performing cases, immediately stenting were performed in 2 patients because of rapidly re-stenosis after balloon angioplasty, two had serious other medical problems, two had personal problems, and one had a failure of stent insertion. Time interval between S-CAS and balloon angioplasty were 12.5 days One acute cerebral infarction possibly due to embolism occurred after stenting but immediately controlled by thrombolysis. There were no complications including hyperperfusion syndrome.

Conclusion: S-CAS is a relatively safe and effective option for selected patients with severe carotid artery stenosis and decreased cerebral flow reserve. The technique of S-CAS may have the possibility of the failure of staged procedures, and the drawback of waiting time between two procedures.

0197
Association of the Age of Patient and the Rate of Stenosis with the Development of Emboli and Acute Infarcts in Carotid Artery Stenting with Embolic Protection Device

DW Park, JH Cheong, YJ Lee

Hanyang University Medical School, Korea.

Purpose: This study is to evaluate the association of the age of patient and the rate of stenosis with the development of emboli and acute infarcts in carotid artery stenting (CAS) with embolic protection device (EPD).

Materials and Methods: Forty-eight consecutive patients (49-81 years old, mean; 68.2), who underwent CAS with EPD due to proximal internal carotid artery stenosis were included. All of them received oral aspirin (100 mg) and clopidogrel (75 mg) daily for a minimum 5 days prior to the procedure, and initial intravenous bolus injection of heparin of 1500-3000 IU with

1000 IU at 1 hour later. Pre-stenting balloon dilatation was performed in the stenotic area under EPD placement before CAS. Diffusion weighted MR imaging was performed one day after CAS. Patients were classified into three groups with no, small and large emboli captured within EPD, which were compared with medical and radiological information.

Results: No, small and large emboli are identified within EPD in each 20, 12 and 16 patients. The older age and the more severe stenosis are associated with the development of emboli and acute infarcts (P value < 0.1).

Conclusions: In patients treated with CAS under EPD, older age and the rate of stenosis tend to be related with the development of emboli and acute infarcts. Therefore in the patients with risk factors, it's essential to carefully manage the procedure of CAS with EPD.

0221
Tips of Balloon Occlusion Test and Transarterial Embolization for Carotid Body Tumors

T Asai[1], S Miyachi[1], T Izumi[1], N Matsubara[1], T Yamanouchi[1], K Ota[1], K Oda[1], Y Fujimoto[2], T Wakabayashi[1]

[1] Department of Neurosurgery, Nagoya University Graduate School of Medicine, Japan. [2] Department of Otolaryngology, Nagoya University Graduate School of Medicine, Japan.

Purpose: Preoperative transarterial embolization (TAE) of carotid body tumor(CBT) is effective to reduce the bleeding volume during the tumor removal. Vascular injury may occur in the operation because of severe adhesion of tumors to carotid artery resulting in sacrificing the ipsilateral carotid artery including bifurcation. It is why special balloon occlusion test (BOT) is important to check the collateral flow simulating the situation of maximum vascular sacrifice. We report the tips of preoperative BOT and TAE of CBT.

Materials and Methods: Between 2005 and 2012, we performed the BOT and TAE for 5 patients (mean age 36.2 years old, 4 females) of CBT in our institution. We performed double BOT for all 5 patients and assessed the neurological symptom or collateral flow. We used NBCA or PVA particles depending on the type of feeding artery. Tumor removal was performed by otolaryngologists.

Result: In BOT, We occluded CCA+ICA (3 cases), CCA+ ECA (1 case) and ICA+ECA (1 case). 4 patients were tolerant, but one patient suffered from hemiparesis during hypotension test. In TAE, We used PVA (2 cases), NBCA (1 case), NBCA+PVA (1 case) and Coil+PVA (1 case) and we achieved total occlusion of feeders in 4 patients. In all patients there were no complications during procedures. All tumors were totally removed within 7 days (mean 4.6 days) after TAE. The volume of intraoperative blood loss was mean 139.4ml. In one patient, injury of CCA was occurred and during repairing the injury site CCA was clamped transiently but it didn't result in any ischemic stroke.

Conclusion: Preoperative BOT and TAE were safe and effective and contributed to the low bleeding volume and total tumor removal.

0222
Clinical Influence of Low Response to Clopidgrel on Neuro-Endovascular Treatment

T Asai[1], S Miyachi[1], T Izumi[1], N Matsubara[1], K Haraguchi[2], T Yamanouchi[1], K Ota[1], K Oda[1], T Wakabayashi[1]

[1] Department of Neurosurgery, Nagoya University Graduate School of Medicine, Japan. [2] Department of Neurosurgery, Toyohashi Municipal Hospital, Japan.

Purpose: Low response and resistance to antiplatelet drugs is one of the risk factors of ischemic events especially reported from cardiologists who performed percutaneous coronary intervention. In our institution, we analyze platelet aggregation activity before neuro-endovascular treatment with VerifyNow platelet function test. We will report the influence of low response to clopidgrel on the clinical outcome of neuro-endovascular treatment.

Materials and Methods: Between August 2010 and February 2013, 248 patients (mean age 63.7, 123 males) taking clopidgrel since more than 1week before endovascular treatment were investigated. The endovascular treatments for them included carotid artery stenting in 85, aneurysmal saccular packing in 163 patients. We defined ischemic complication as permanent symptomatic events within 30 days. We also checked the MRI-DWI within 7 days, and judged high intensity spot bigger than 5mm as positive. We defined as low response to clopidgrel >230 P2Y12 Reaction Unit (PRU) in this study.

Result: Eighty-six patients (34.7%) were low responder to clopidgrel. Ischemic complications occurred in 3 of 86 patients (3.5%) in low responder compared with 7 of 162 patients (4.3%) in responder (odds ratio (OR) 0.80; 95% confidence interval (CI); 0.20-3.18, P=1.0). The new high intensity spot bigger than 5mm were seen in 30 of 86 patients (34.9%) in low responder compared with 36 of 158 patients (22.8%) in responder (OR 1.82; 95%CI;1.02-3.24 P=0.042).

Conclusion: Low response of clopidgrel may have little influence for clinical outcome, however it may increase asymptomatic ischemic lesions due to the large thromboembolism.

0251
Home Check System to Monitor the Anti-Coagulation Therapy with Warfarin: Experience of Inratio2® for a Stroke Patient

O Keisuke, M Shigeru, I Takashi, M Noriaki, A Takumi, Y Takashi, O Keiko, W Toshihiko

Depertment of neurosurgery Nagoya university graduate school of medicine, Japan.

Purpose: Anticoagulation therapy with Warfarin is still a gold standard to prevent the cerebral embolism due to atrial fibrillation although new drugs have been

released. Drug effect is usually monitored with INR, which is the most sensitive and confident value to arrange the amount of Warfarin. However, the frequent check in the outpatient door is required for the minute control, and it may load the physical stress for handicapped patients. We adopted the investigation machine INRatio2® (Alere Medical Co) to check INR for a patient with a sequel of the cerebral embolism at home to reduce her burden.

Patient profile: The patient is 65 year-old female, with the right hemiparesis and aphasia due to 3 times of cerebral embolism. It is very difficult to control Warfarin therefore she had to undergo taking a blood frequently resulting in the difficulty of sampling site. The value of INR was checked several times both in usual laboratory examination and in INRatio2®. After no discrepancy of results was confirmed between two examinations, we trained her family and home nurse how to deal and investigate. INRatio2® was lent and INR taken every week were reported in the outpatient door.

Conclusion: INRatio2® is a convenient appliance that reliable INR result is provided in approximately 30 seconds with only one drop of blood by the puncture of the finger apex. It is very useful to warfarin control of blood sampling particularly for severely disabled patient. As further deployment to make the home management easier, automatic according to medical records, such as application to home medical care using telemedicine network system should be needed.

0269
Use of Amplatzer Vascular Plug in Interventional Neuroradiology

Jai Shankar, R Vandorpe

Dalhousie University, Canada.

Purpose: Amplatzer vascular plug(AVP) has been used for transcatheter embolizations in peripheral vasculature; occlusion of abnormal vessel communications and other neurovascular conditions4, 5. We report different uses of endovascular AVP treatment in Interventional Neuroradiology.

Materials and Methods: We retrospectively reviewed our interventional neuroradiology database from November 2010 to October 2012 and found 5 patients who were treated with endovascular AVP treatment. AVP was used for vessel occlusion in all of these patients. Two patients presented with carotid blowout with massive hematemesis from oral cancer, 2 patients had preoperative balloon test occlusion and sacrifice and 5th patient had massive hematemesis from erosion of the right internal jugular vein from oral cancer.

Results: The right internal carotid artery (ICA) was sacrificed without balloon occlusion test (BOT) in 2 patients with carotid blowout. The left ICA was occluded after BOT in 1 patient and the left vertebral artery was occluded after BOT in 1 patient. The right internal jugular vein was occluded without BOT in 1 patient. AVP was deployed in all patients using 5 french guiding catheter. In 2 out of the 5 patients 2-3 coils were used in addition to the AVPs. In all cases, more than one AVPs were used and the occlusion was almost immediate with no thrombo-embolic complications. Compared to expected number of coils needed to occlude these vessels, we believe use of AVP was significantly cheaper.

Conclusion: Use of AVP is feasible, safe, fast and cost-effective method for occlusion of larger size vessels for different indication.

0286
Changes after Direct Engagement of Neurologist in Intra-Arterial Thrombolysis for Acute Ischemic Stroke: Single Center Experience

JH Seo[1], ST Kim[2], HW Jeong[3], EG Kim[1]

[1] Department of Neurology, Busan Paik Hospital, School of Medicine, Inje University, Busan, Korea. [2] Department of Neurosurgery, Busan Paik Hospital, School of Medicine, Inje University, Busan, Korea. [3] Department of Diagnostic Radiology, Busan Paik Hospital, School of Medicine, Inje University, Busan, Korea.

Backgrounds: Good clinical outcomes following successful recanalization is significantly time-dependent. On the assumption that direct engagement of neurologist could be affected time frame for visit to recanalization, we evaluated the *Results:* of before-and-after direct engagement of neurologist in Intra-arterial thrombolysis (IAT).

Methods: We compared two periods between January 2011 to February 2012(not engaged group) and March 2012 to February 2013(engaged group). Since March 2012, neurologist directly engaged IAT for acute ischemic stroke. We assessed 269 patients in not engaged group and 275 patients in engaged group with non-hemorrhagic stroke within 8 hours after onset. We analysed time frame from onset to recanalization, NIHSS score, successful recanalization (Thrombolysis in Cerebral Infarction 2a–3) and favorable outcome (modified Rankin scale score ≤2) at day 90. Time frame from onset to angiographic recanalization was classified as time from onset to visit, decision, needle and recanalization.

Results: In not engaged group, 53 patients(19.7%) was performed cerebral angiography and 33(62.3%) received IAT. Successful recanalization was achieved in 21 of 33 occlusion(63.6%) and favorable outcome in 12 of 33 (36.4%). In engaged group, 87 patients(29.4%) was performed cerebral angiography and 81(93.1%) received IAT. Successful recanalization was achieved in 57 of 81 occlusion(70.4%) and favorable outcome in 31 of 81 (38.2%). Time from visit to decision, needle and recanalization in engaged group was significantly shorter over 30 minutes.

Conclusions: Direct engagement of neurologist contributed to decrease time from visit to decision, needle and successful recanalization.

0325
Acute Phase Ischemic Stroke Endovascular Treatment

D Czerny[1], T Jonszta[1], V Prochazka[1], J Krajča[1], M Kuliha[2], M Roubec[2]

[1] *Intervent.neuroradiology and angiology dep. Radiology clinic FN Ostrava, Czech Republic.* [2] *Neurology clinic FN Ostrava, Czech Republic.*

Introduction: Ischemic stroke is the third most common cause of death nowadays and in case of severe neurological deficit generates significant socio-economical problems. There are methods of mechanical revascularization by means of PTA, stent implantation or mechanical thrombectomy available nowadays in cases of ineffective intravenous rt-PA treatment.

Methods: Retrospective analysis of 242 patients, who suffered ischemic stroke, treated between 8/2005-7/2012 by endovascular methods was performed. In 146 men and 95 women mechanical thrombectomy was performed in 62 cases, thrombolytic therapy with intra-arterial rt-PA in 39 patients and stent implantation in 104 cases. Intravenous rt-PA was administered prior to intervention in 115 cases. Angiography detected ICA occlusion in 64 patients, M1 occlusion in 114, M2 occlusion in 14 cases, ACA in 1 case, basilar occlusion in 28 and vertebral artery occlusion in 9 patients.

Results: In 94 patients TIMI 3 recanalization was achieved, TIMI 2 in 104. Minimal to no recanalization was noted in 44 patients. SICH was detected in 6 cases, non SICH in 26 patients.

Conclusion: It was difficult to determine the effect of thrombolytic therapy in various etiology and localization of cerebral vessels occlusion in ECASS and NINDS studies. The recanalization by means of PTA, neurostent implantation or mechanical thrombectomy seem to be the most efficient methods in achieving antegrade flow restoration for ACM, basilar artery or T-type occlusion in our group of patients. The time to the start of the procedure, initial NIHSS score, occlusion localization and TICI 3 flow restoration are essential for favourable outcome – Rankin scale 2 or less.

0326
Early Stenting for Symptomatic Extracranial Carotid Stenosis Considering Symptom Onset and Dual Antiplatelet Use

NR Yang[2], SH Park[3], BJ Kim[2], KH Kim[2], HS Byun[2], JY Yeon4, KI Jo[4], P Jeon[2]

[2] *Department of Radiology, Samsung Medical, Sungkyunkwan University School of Medicine, SEOUL, Korea.* [3] *Department of Neurology, Pohang St. Mary hospital, Pohangsi, Kyungsangbukdo, Korea. 4 Department of Neurosurgery, Samsung Medical, Sungkyunkwan University School of Medicine, SEOUL, Korea.*

Early carotid endarterectomy for transient ischemic attack and acute stroke is generally known as reasonable treatment rather than delayed surgery. However, it is obscure that when the best timing of carotid artery angioplasty and stenting (CAS) for symptomatic patients is. The aim of this study is to evaluate safety of early CAS. We retrospectively analyzed data of 197 consecutive patients(mean age; 68.7 ± 10.3 years) with symptomatic extracranial carotid stenosis, treated with elective CAS between January 2008 and May 2013. Firstly, patients were divided depending on timing from symptom onset. Then, patients were categorized by period of use dual anti-platelet agents before CAS. Neurologic complication was defined as new neurologic symptom and sign lasting over 24 hours after CAS.

Totally, neurologic complication rate was 4.1% (8 of 197 patients). Regarding timing of CAS, neurologic complication rate was 10.0% in patients treated with less than 3 days from symptom onset, 3.6% from 4 to 7 days, 3.7% from 8 to 14 days, and 3.8% after 2 weeks. Regarding period of use of dual anti-platelet agents before CAS, neurologic complication rate was 6.0% with less than 3 days, 2.6% from 3 to 7 days, 0% from 8 to 14 days, and 4.8% after 14 days.

In this study, early CAS for symptomatic carotid stenosis seems to be relatively safe and feasible if CAS is conducted after 3 days from symptom onset. In addition, treatment of dual anti-platelet agents before CAS at least for 3 days would be necessary to prevent neurological complication. Therefore if early CAS is conducted after 3days from symptom onset and with 3days of dual antiplatelet use, Early CAS would be reasonable.

0338
In-Stent Thrombus Formation at 2 Weeks Following Cas Predicts Neointimal Hyperplasia after 2 Years

K Yamashita, Y Kaku, J Kokuzawa, N Funatsu, M Miyai

Department of Neurosurgery, Asahi University Murakami Memorial Hospital, Japan.

Purpose: The purpose of the present study is to clarify the dynamic change of in-stent neointimal layer and residual arterial lumen by 2 years following CAS using the 3D CTA with volume rendering.

Materials and Methods: 36 stented carotid arteries in 34 consecutive patients were examined by 3D CTA with volume rendering at 2 weeks and 3, 6, 12, 24 months of follow-up.

Results: In-stent thrombus could be detected in 10 of 36 (27.8%) carotid arteries at 2 weeks after CAS. In-stent thrombus gradually declined thereafter by 3 months. In the course of longer follow-up, the layer of the neointima continued to grow in size for up to 24 months. Patients with in-stent thrombus at 2 weeks following CAS had the thicker layer of neointima at 24 months than patients without thrombus. The Predictive factors for growing neointimal hyperplasia at 24 months in multivariate analysis were pre-treatment ulcer formation and the thickness of in-stent thrombus at 2 weeks following CAS.

Conclusion: Our *Results:* suggest that longer follow-up should be continued following CAS, especially in cases with the pre-treatment ulcer formation and with subacute in-stent thrombus formation.

0346
Locked-in Syndrome Is Rare Neuropsychological Disorder. A Patient with Quadriplegia with Loss of all Cranial Nerve Expect the Movement of the Eye. MRI Brain of the Was Done Showed Extensive Lension in Pons Medulla N Left Cerebellum

Kira Dyawarkonda

Kokilaben Hospital, India.

Locked-in syndrome is a rare neuropsychological disorder. Its primary features are quadriplegia and paralysis of the cranial nerves except for those eye movements. The differential diagnosis includes, brain death, minimally conscious state,alanto-axial joint facture, presistant vegetative state . Causes of locked-in syndrome include hemorrhagic and thrombotic events, tumors affecting the ventral pons, infectious agents, iatrogenic causes, trauma, metabolic abnormalities, and other miscellaneous causes.

0416
Restored Brain Perfusion after Non-Invasive Stimulation of the Facial Nerve in a Canine Stroke Model

F Castro Prado[1], MK Borsody[2], A Garcia[3], E Sacristan[3], J Azpiroz[3]

[1] Hospital Central Norte Azcapotzalco Pemex, Mexico. [2] MD-5 GmbH, Leipzig, Germany. [3] Center for Medical Instrumentation and Imaging Research, CI3M Metropolitan Autonomous University, Mexico.

Ischemic stroke affects over 15 million patients per year and is a leading cause of death worldwide. Currently-available treatments are indicated for less than 5% of patients. Stimulation of the facial nerve has been proposed as a possible new treatment of ischemic stroke that acts by increasing blood flow to the brain and thereby restoring perfusion through collateral vessels. The objective of this project was to evaluate the changes in brain perfusion, following facial nerve stimulation in an animal stroke model using Magnetic Resonance Imaging (MRI) measures of cerebral blood flow. Autologous blood clot was injected in the internal carotid artery to occlude the middle cerebral artery (MCA) in 17 mongrel dogs, it was done by selective catheterization using Digital Subtraction Angiography (DSA). Occlusion in the MCA was verified using DSA and MRI angiography. Following baseline and post-stroke MRI images, the facial nerve at the site of the geniculate ganglion was located and then stimulated using a transcranial magnetic stimulator and a neuro-navigation system in 11 animals. Six animals followed the same procedure but were not stimulated (control group). The perfusion index of both sides of the brain was measured using gadolinium contrast MRI before and after stroke, and at 30 minute intervals after stimulation. *Results:* show a significant and persistent increase in perfusion in the stroke side of the brain relative to the non-stroke / contralateral side, after stimulation, when compared to the control group. These *Results:* strongly support the future development and evaluation of a non-invasive facial nerve stimulator device for the early treatment of ischemic stroke

0422
Angioplasty with the Wingspan Stent System for Symptomatic Stenosis of Middle Cerebral Artery

D Lin, JQ Hu, H Jiang, J Zhu, WG Zhao, JK Shen

Shanghai Ruijin Hospital, China.

Objective: Atherosclerotic middle cerebral artery stenosis is a potentially devastating cause of cerebral ischemia and stroke.This article presented the clinical outcomes of angioplasty with the Wingspan Stent System for symptomatic stenosis of middle cerebral artery in a consecutive series of patients.

Materials & Methods: From March 2008 to April 2012,Seventy-six patients(mean age 56 years) with symptomatic stenosis of middle cerebral artery were performed angioplasty with the Wingspan Stent System. The stenosis rate before and after stenting, major complications and clinical outcome were analyzed.

Results: Seventy-six patients were performed angioplasty with the Wingspan Stent System. The stenosis rate reduced from (78.4±12.4)% to (20.8±9.3)%. Complications were in three patients (3.9%).One case occured intracranial hematoma was death.Two infarction led to transient neurologic dysfunction.One new stroke events happened within 30 days. Fourty-nine patients were performed cerebral angiography at 6 months after stenting,restenosis was detected in four patients without ischemic attack and one patient with ischemic attack .

Conclusion: Intracranial angioplasty can be perforrmed with a high degree of technical success and a low risk of complications.More clinical follow-up is needed.

0526
A New Approach to Decrease the Embolic Complications of Cas: Coating the Atherosclerotic Plaque by Covered Stent

E Akgul, G Cikman, C Yalcin, E Asgarova, T Balli, K Aikimbaev, EH Aksungur

Radiology Department, Medical Faculty, Cukurova University, Turkey.

Purpose: To evaluate the effectiveness of coating the atherosclerotic plaque by a covered stent before the implantation of bare carotid stent for preventing the distal microembolic complications of extracranial CAS.

Material and Methods: Fifty patients aged 52 to 82 years were the participants of the study. 15 atherosclerotic ICA lesions of 14 patients were treated by using both covered and bare stents in the same lesion and 40 ICA lesions in 36 patients were treated only by bare carotid stents as control group.

Atherosclerotic plaque was jailed between the vessel wall and the balloon-expandable covered stent to prevent the embolization of plaque fragments through the stent meshes during bare stent implantation and balloon dilatation.

Distal protection devices were used. Antiaggregation and anticoagulation therapies were applied. Acute ischemic foci due to possible microembolic complications were evaluated by DWI MRI just before and one day after the process. Stent restenosis rate was checked by DSA at the end of the 6th month and by Doppler ultrasonography on 1, 3 and 6th months.

Results: Acute ischemic lesions were detected in 7 of 14 (50%) patients in the covered stent group and in 30

of 36 patients (83.3%) in the control group. Significant restenosis (over 50%) was detected in 2 patients of each group (13.3% in covered stent group and %5.6 in control group).

Conclusion: Covered stents are effective to decrease the embolic complications of CAS. Nevertheless high restenosis ratio restricts the usage which complies with the literature.

4 - Intracranial Aneurysms

0006
Endovascular Treatment of Posterior Cerebral Artery Aneurysms

T Kataoka, T Ogino, H Endo, H Nakamura

Department of Neurosurgery, Nakamura Memorial Hospital, Japan.

Purpose: The purpose of this study was to evaluate the clinical presentation, radiological features, and endovascular treatment of the posterior cerebral artery (PCA) aneurysms.

Materials and Methods: From 1998 to 2012, we treated eight cases of PCA aneurysms using endovascular technique. The locations of the aneurysms were P1-P2 in 4 cases and P2-P3 in 4 cases. In P1-P2 aneurysms 3 of 4 were smaller than 10mm, and in P2-P3 aneurysms 3 of 4 were larger than 10mm. 3 patients of P1-P2 aneurysms were flow related aneurysms, because they were associated with AVM, ipsilateral internal carotid artery occlusion, and Moyamoya disease. 3 cases of P2-P3 aneurysms were partially thrombosed large or giant aneurysms. 4 cases were presented with subarachnoid hemorrhage, 3 cases were presented with mass-effects, and 1 case was incidental.

Results: All aneurysms were successfully treated with endovascular coil embolization. P1-P2 aneurysms were treated with aneurysm coil embolization. P2-P3 aneurysms were treated with parent artery coil occlusion. Post treatment complications occurred in two cases of P2-P3 aneurysms. One case was hydrocephalus, and the other was perforator infarction. In both cases, transient expansion of the partially thrombosed aneurysm was the cause. Prognosis were modified Rankin Scale(mRS) 0 in 5 cases, mRS 1 in 2 cases and mRS 2 in 1 case.

Conclusions: P1-P2 aneurysms were smaller than P2-P3 aneurysms, tended to flow related aneurysms, and aneurysm embolization was safe and effective. P2-P3 aneurysms tended to partially thrombosed large aneurysm, parent artery occlusion was effective, but transient expansion of the aneurysm may cause aggravation of the symptom.

0028
Treatment for Ruptured Vertebral Artery Dissecting Aneurysms

O Hamasaki, T Hidaka, Y Kurokawa, U Yonezawa, F Ikawa

Department of Neurosurgery, Shimane Prefectural Central Hospital, Japan.

Purpose: We evaluated the outcome of endovascular or surgical treatment of ruptured vertebral artery dissecting aneurysms (VADAs), and investigated the relationship between treatment complications and development and location of posterior inferior cerebellar artery (PICA).

Material and Methods: We treated 14 patients (12 men, 2 women; mean age, 56.2 years) with ruptured VADAs during March 1999–June 2012 at our hospital. Hunt and Hess grades 1–3 and 4–5 were observed in 6 and 8 patients.

Results: Twelve patients underwent internal endovascular trapping, 1 underwent proximal occlusion alone, and 1 underwent proximal occlusion in the acute stage and occipital artery-PICA anastomosis and surgical trapping in the chronic stage. The types of VADAs based on their relative location to the ipsilateral PICA were distal, PICA-involved, and non-PICA in 9, 2, and 3 patients. The types of PICA based on their development and location were bilateral anterior inferior cerebellar artery (AICA)-PICA, ipsilateral AICA-PICA, extradural, and intradural type in 1, 2, 2, and 9 patients. Two patients with a high anatomical risk developed medullary infarction; however, their outcome was relatively better than the other reports. The modified Rankin scale indicated grades 0-2, 3-5, and 6 in 8, 3, and 3 patients.

Conclusion: A good outcome of ruptured VADAs treatment using internal endovascular trapping is often obtained, except with the PICA-involved type, even with high-grade subarachnoid hemorrhage. Treatment of PICA-involved type is controversial. The anatomical location and development of PICA may be predicted by the complication with postoperative medullary infarction.

0036
Initial Clinical Experience with the Target® Nano Detachable Coil for Small Aneurysms: Preliminary Reports

CW Ryu[1], HS Shin[1], JS Koh[1], BM Kim[2], P Jeon[3], JC Park[4], DC Suh[4]

[1] Neurointervention unit, Kyung Hee University Hospital at Gangdong, Seoul, Korea, Korea. [2] Department of Radiology, Severance Hospital, Seoul, Korea, Korea. [3] Samsung medical center, Seoul, Korea, Korea. 4 Departments of Radiology and Research Institute of Radiology, Asan Medical Center, Seoul, Korea, Korea.

Background and Purpose: Small intracranial aneurysms pose a significant therapeutic challenge for interventional neurointerventionists. Recently, very small-sized platinum coil below 1.5 mm (Target® Nano™ coil) with the increase of softness were developed to increase the packing density. The aim of this study was to evaluate the efficacy and safety of this coil.

Materials and Methods: Retrospective angiographic and clinical analysis was performed for the 27 consecutive small (maximum diameter ≤4 mm) aneurysms which were treated with the endovascular embolization and for which at least two Nano™ coil were used. The clinical and angiographic *Results:* were assessed, and factors that affect the packing density were also investigated.

Results: The mean maximum diameter of aneurysms was 3.28+0.75 mm. Of 27 aneurysms, seven were ruptured, as opposed to 20 that were not. Mean number of Nano™ coil that were used for each aneurysms was 2.74 (range 2-4), and mean length of sum of Nano™ coils per each aneurysms was 5.78±2.15cm. The rate of NanoTM coil length to total coil length was 55.79%±24.15%. Mean packing density was 50.48±21.03%. Angiographic results (Raymond classification) were complete in 21, residual neck in 5, and dog-ear remant in 1. Technical complications occurred in 3 cases (1 rerupture, 2 coil protrusion) and there was one death related with endovascular procedure. Multiple regression analysis showed a significant association of packing density with the length of Nano™ coil ($p<0.05$) and with aneurysm size ($p<0.05$).

*Conclusion:*The use of the Nano™ coil permits safe and effective embolization of a cerebral aneurysm and contributes to an increase of packing density.

0037
Catheter-Assisted Coil Embolization for Intracranial Aneurysms

H Oishi[1], M Yamamoto[1], S Nonaka[1], Y Suga[1], T Shimizu[2], M Watanabe[3], K Yoshida[4], T Mitsuhashi[5], H Arai[1]

[1] Department of Neurosurgery, Juntendo University School of Medicine, Japan. [2] Department of Neurosurgery, Juntendo University Nerima Hospital, Japan. [3] Department of Neurology, Juntendo University Urayasu Hospital, Japan. [4] Department of Neurosurgery, Tokyo Metropolitan Hiroo Hospital, Japan. [5] Department of Neurosurgery, Tama Nanbu Chiiki hospital, Japan.

Introduction: Satisfactory aneurysm occlusion is an important factor in preventing bleeding and recanalization after coil embolization of intracranial aneurysms. To date, only a few embolization techniques (i.e., balloon-assisted, double catheter, stent-assisted) have been reported. We propose a novel technique with a triple coaxial system using a 4French (F) catheter.

Materials and Methods: All of the patients who underwent the procedure under general anestethesia and systemic heparinization. A 7F guiding catheter was placed in the internal carotid artery of the vertebral artery, depending on the location of the aneurysm. A 4F intermediate catheter was coaxially advanced with the assistance of the 0.035-inch guidewire as close as possible to the aneurysm neck. A microcatheter was inserted into the aneurysm via a 4F intermediate catheter. Platinum coils were inserted into the aneurysm until no other coils could be inserted.

Results: Between September 2011 and May 2013, 43 aneurysms (unruptured 34, ruptured 5, retreatment 4) were treated with this technique. The location of the aneurysm was the internal carotid artery in 34, the anterior cerebral artery in 4, the middle cerebral artery in 1, posterior circulation in 4. The overall immediate anatomical outcomes are CO 29 (69.0%), RN 6 (14.3%), and RA 7 (16.7%). Iatrogenic carotid cavernous fistula occurred in one patient without clinical modification.

Conclusions: A 4F immediate catheter placed as close as possible to the aneurysm neck is useful to achieve sufficient stability of the microcatheter. Catheter-assisted coil embolization for intracranial aneurysms is both feasible and effective.

0055
"Super-Masamune" Balloon Micorocatheter - A Newly Developed Very Compliant Double Lumen Balloon Microcather

M Ezura, N Kimua, H Uenohara

NHO Sendai Medical Center, Japan.

We have already developed Masamune balloon microcatheter [1].

We recently developed "Super-Msamune", a new type of Msamune balloon microcatheter, in which the balloon is modified into more compliant. The balloon itself is very compliant. It is more compliant than HyperForm, but is not single lumen but double lumen. It easily herniates to free space and makes better neck protection possible. Because of double lumen and having double marker, it can be used only for neck plasty balloon, but also for the catheter for coil insertion. We will show initial experiences of this balloon in this presentation. The balloon is still immature now and further modification would be necessary. It would become commercially available within 1 year.

Reference:

1 Ezura M, et al.: A newly developed 3 cm marker balloon microcatheter. IntervNeuroradiol. 15: 237-240, 2009.

0065
Reverse Stent-Assisted Coil Embolization in Complex Fusiform and Blood Blister-Like Aneurysms

Ys Kim[1], Hw Jeong[2], Sw Lee[1], Sk Baik[1]

[1] Pusan National University Yangsan Hospital, Korea. [2] Busan Paik Hospital, Korea.

Purpose: The treatment of complex fusiform and blood blister-like aneurysms are still challenging. We

present initial experience with the use of reverse stent-assisted coil embolization in complex aneurysm which provide compact packing density and secure patency of parent artery.

Materials and Methods: A total of 5 patients harboring four large fusiform aneurysms and two blister-like aneurysms were treated with the reverse stent technique.

It involved the following steps:

(1) Passage of the microcatheter for stent delivery into the distal branch under the guidance of the microwire;

(2) Microcatheter selection and coil embolization as routine manner likes saccular aneurysm;

(3) When just before the parent flow stagnation, enough radial force profiled stent was employed;

(4) A post-stent deployment angiography perform to confirm the parent artery patency;

(5) If parent artery flow was insufficient, then additional stent could be deployed.

Results: The fusiform aneurysm size was 16.8 mm on average and blister-like aneurysm sizes were 3mm and 1.5mm. One fusiform aneurysm and blister-like aneurysms have subarachnoid hemorrhage. A single stent was used in 3 patients, double stents in 2 patients. The treatment was successful in all 5 patients. One complication was distal branch occlusion with acute cerebral infarction. Angiographic follow-up was available for 2 patients at a mean time point of 3.6 months. It showed all aneurysms occlusion without parent artery occlusion or stenosis.

Conclusion: Reverse stent-assisted coil embolization is a feasible *Method:* for complex aneurysms. And it may have a reasonable safety-efficacy profile in select patients.

0066
Clinical and Angiographic Results in Treatment of Wide-Necked Aneurysms Using Soiltairetm AB Stent

KS Chae, SY Lee, HK Choi, SJ Rho, JH Shim, HS Park, CG Kang

Bongseng memorial hospital, Korea.

Objective: The purpose of this study is to evaluate clinical outcomes and angiographic results of patients with intracranial wide-necked aneurysms treated by using the Solitaire stent.

Methods: From October 2010 to December 2011, a total of 22 patients were treated by using the Solitaire. One patient who had dissecting aneurysm was excluded, resulting 21 patients with 21 wide-necked aneurysms. Technical success rate, procedure-related complications, angiographic results, and clinical outcomes were retrospectively analyzed. Follow-up angiography was performed between 7 and 16 months (mean 12.1 months) after the procedure.

Results: The technical success rate was 100% and there was no procedure-related complication. Follow-up angiographies showed that the rate of complete occlusion, neck remnants, and incomplete occlusion were 57.1%, 38.1%, and 4.8%, respectively.

Conclusion: We carefully suggested that the Solitaire stent might be associated with a high rate of technical success with good navigability and increase the occlusion rate of aneurysms in follow-up angiographies. Long-term follow-up is mandatory to support these early observations.

0079
Enlarged Parent Artery Lumen at Aneurysmal Neck Segment in Wide-Necked Cerebral Aneurysms

JW Lee[1], OK Im[2], DH Lee[1,2]

[1] University of Ulsan College of Medicine, Korea.
[2] Asan Medical Center, Korea.

Purpose: In the morphologic analysis of a wide-necked aneurysm before endovascular treatment, we usually focus on the aneurysm itself. In this study we paid special attention to the parent artery (PA) since we frequently noted that the PA diameter at the neck segment was larger than that of any other segments. We hypothesized that the PA diameter of the aneurysm-neck segment is wider than those of normal segments. We conducted a 3D angiographic data analysis to see the relationship between the aneurysm neck and PA diameter in wide-necked aneurysm cases which were treated with stent-assisted coiling.

Methods: We retrospectively collected 26 consecutive cases of distal ICA aneurysm which were treated with stent-assisted coiling. Through the build-in software we could obtain the profile of the cross sectional radii along the PA centerline. Cross-sectional vessel area were measured at 4 points along the profile, i.e. P1 (the vessel area at proximal normal segment), P2 (at the most proximal of the ostium), P3 (at the most distal of the ostium), and P4 (at distal normal segment). We performed a Friedman test and a Wilcoxon-signed rank test for post hoc analyses.

Results: There were no significant differences between the P3 and P4 (p=.763). However, there was a statistically significant difference in P1 and P2 (p=.015).

Conclusion: The parent artery diameter especially at the proximal portion of the aneurysm ostium is significantly larger than that proximal normal segment. One should consider this morphological change in the selection of proper stent diameter for the endovascular treatment of wide-necked aneurysms.

0113
Stent-Assisted Endovascular Coiling of Basilar Artery Aneurysms Associated with Fenestration. A Report of Two Cases.

KS Jang[1], AS Turk[2], B Aagaard-Kienitz[3]

[1] Incheon St. Mary's Hospital, The catholic university of Korea, Korea. [2] Neurointerventional surgery, Medical university of South Carolina,USA, United States of America. [3] Neuroradiology,University of Wisconsin, Madison, WI, USA, United States of America.

Objective: Aneurysms at the vertebrobasilar junction are rare lesions but when present often associated with a fenestration of the proximal basilar artery. We present 2 cases of vertebrobasilar junction aneurysms associated with fenestration of the basilar artery, which were

successfully treated with stent-assisted endovascular coiling

Methods: There were two patints who have the unrupterued cerebral aneurysms associated with fenestration of the basilar artery. These aneurysms have wide neck on the cerebral angiographic images and located in the vertebrobasilar junction. Both aneurysms were seen in the left vertebral angiography.

Results: We treated both patients with Neuroform stents with various coil. Aneurysms were successfully treated with stent-assisted endovascular coiling. Complete coil embolization of the aneurysms were achieved (Raymond 0) without complications. Eight year follow-up using MRA demonstrates that the aneurysm remains completely embolized without recurrence and the stented vessel completely patent in one of two patients.

*Conclusion:*Our two cases demonstrate successful stent assisted complete coil embolization of complex aneurysms with preservation of the fenestration limbs. These procedures occurred without complication and the patients remained neurologically intact. Careful evaluation of these complex aneurysms utilizing bilateral vertebral artery angiograms and 3D reconstructions are recommended to understand the anatomy and formulate the best plan for complete aneurysm treatment while maintaining patency of all vessels.

0122
Y-Configuration Stent-Assisted Coiling Using 2 Closed-Cell Stents for Wide-Neck Basilar Tip Aneurysms

DI Kim[1], BM Kim[1], P Jeon[2], DJ Kim[1], EH Lim[1]

1 Yonsei University College of Medicine, Severance Hospital, Korea. 2 Sungkyunkwan University School of Medicine, Samsung Seoul Hospital, Korea.

Purpose: The aim of this study was to evaluate clinical and angiographic outcomes of Y-

Methods: All patients who underwent Y-stent-assisted coiling using 2 closed-cell stents were recruited from prospectively maintained neurointerventional database in 3 hospitals. Clinical and angiographic outcomes were retrospectively evaluated.

Results: Twenty-five patients (M:F=6:19; unruptured: ruptured=22:3; mean age, 56 years) underwent Y-stent-assisted coiling using 2 closed-cell stents for wide-necked basilar tip aneurysms. Y-stent-assisted coiling was performed as a first-ever treatment in 18, a retreatment in 4 and a third retreatment in 3 patients. Immediate post-treatment angiographic outcomes were near complete/complete occlusion in 20 and incomplete in 5 patients. Treatment-related thromboembolic complications occurred in 3: 2 in-stent thrombosis and 1 embolic infarction, resulting in modified Rankin scale score, 2 in 2 and 4 in 1 patient, respectively. Two patients died, one from initial subarachnoid hemorrhage and the other from intra-cerebral hemorrhage due to underlying Moyamoya disease. The remaining 20 patients had mRS, 0 or 1 during the follow-up of a mean of 25 months. Follow-up angiography was available at 6 – 24 months in 18 aneurysms. Sixteen aneurysms showed improved or stable occlusion but 2 major recurrences occurred, both of which were large thrombosed aneurysms treated with Y-stent-assisted coiling as a third retreatment.

Conclusions: Y-stent-assisted coiling using 2 closed-cell stents seemed to be feasible and a durable treatment option for wide-necked basilar tip aneurysms except for large thrombosed aneurysms.

0125
Coil-protected Embolization for Branch-incorporated Aneurysm

DI Kim[1], BM Kim[1], DJ Kim[1], EH Lim[1], YK Yin[2]

[1] Yonsei University College of Medicine, Severance Hospital, Korea. [2] The Catholic University of Korea, St. Vincent Hospital, Korea.

Purpose: A branch-incorporated aneurysm is an aneurysm with a branch incorporated into the sac or neck. It is one of the most difficult aneurysms to treat with coil embolization. The aim of this study is to evaluate the safety and effectiveness of a coil-protected embolization technique for a branch-incorporated aneurysm.

Materials and Methods: Eighteen aneurysms (2 ruptured and 15 unruptured) in 16 patients (mean age, 56 years, range, 40 – 73 years; 6 men and 10 women) were attempted to treat with a coil-protected embolization technique between February 2007 and December 2012. Clinical and angiographic outcomes were retrospectively evaluated.

Results: All aneurysms were successfully treated without any complications during the procedure. Immediate post-treatment angiographies revealed complete or neck remnant in 16 and incomplete occlusion in 2 patients. Two patients had a delayed small embolic infarction in the relevant posterior circulation territory and middle cerebral artery territory 10 days and 14 days later, respectively, but both recovered completely or near completely (modified Rankin scale score, mRS score, 0 and 1, respectively). During the clinical follow-up (mean, 27 months), all patients were reported a mRS score of 0 (n=14) or 1 (n=2). Vascular imaging follow-up (catheter angiography: n=3 and MR angiography: n=12) was available in 15 aneurysms at 6-12 months. All 15 aneurysms showed complete occlusion except for 1 minor neck recurrence that did not require further treatment.

Conclusions: In this series of cases, the coil-protected embolization technique seems to be feasible and effective to treat small-branch incorporated aneurysms.

0155
Tiny Ruptured Aneurysms Dynamically Changed on Digital Subtraction Angiography: 2 Cases Experience

SM Lim, JE Park

Ewha Womans University Mokdong hostpital, Korea.

We experienced two tiny (<2mm) aneurysms in superior cerebellar artery that dynamically changed on digital subtraction angiography (DSA). One patient, who was 47 years old man had no specific medical history sustained a subarachnoid hemorrhage (SAH) from a tiny ruptured superior cerebellar artery aneurysm,

which aneurysm was detected initial DSA, but no visible within 2 hours DSA for embolization and ruptured pseudoaneurysm was found on surgery. The other patient, who was 44 years old woman sustained SAH showed no aneurysm on initial DSA but a tiny aneurysm in superior cerebellar artery on follow up DSA in same site with first patient. This aneurysm was true aneurysm with arterial inflammation in superior cerebellar artery. The final laboratory *Results:* showed no specific abnormality.

0164
A Reproducible Patient-Specific Silicone Vascular Model Using 3-D Angiographic Data, Rapid Prototyping, and Modified Lost-Wax Technique

JH Shim[1], JM Wu[1], SM Hwang[1], OK Im[1], BJ Lee[2], ST Park[3], DH Lee[1]

[1] Asan Medical Center, Korea. [2] SINI, Korea. [3] Soonchunhyang University College of Medicine, Korea.

We would like to present and share our experience of developing a reproducible patient-specific silicone vascular model for various intracranial aneurysms. The model was feasible for successful in vitro study to validate initial medical device development concept. Following is the brief manufacturing method. A rapid-prototype (RP) model was generated by using specific 3-D angiographic data from the patients. The RP model was dipped into silicone mold in sol state. After solidification the RP model was removed from the mold by meticulous dissection of the solidified mold. The empty space was filled with wax. Solidified wax model was gently picked out from the dissected mold. The wax model was painted layer by layer several times (usually 5 times) to achieve a certain thickness of silicone covering the model. By heating the silicone-covered wax model, we could get rid of the wax. We could minimize the friction of the inner surface by applying silicone oil. The model was mounted in the acryl box which was filled with silicone solution with its side branches out of the box so that one could connect the vascular model to a certain flowing circuit. The semisolid state of silicone solution the aneurysms were allowed to pulsate by the pulsatility of the circuit. With this model we could manufacture a robust silicone model which could be used for the in vitro test of medical devices such as stents and coils for the treatment planning of complex neurovascular lesions.

0171
Extracranial Pica Aneurysm Causing Intracranial Subarachnoid Hemorrhage

GL Horn, Z Metwalli, S Gopinath, G Benndorf

Baylor College of Medicine, United States of America.

Purpose: Extracranial vascular pathology uncommonly causes intracranial subarachnoid hemorrhage. Among possible lesions are aneurysms arising from a posterior inferior cerebellar artery (PICA) with extracranial origin in the upper cervical vertebral artery. We present the unusual case of a ruptured saccular aneurysm of an extracranial PICA that was successfully managed by endovascular occlusion.

Materials and Methods: A 55-year-old presented with a sudden, severe headache. The patient was transferred to our institution after a CT scan revealed hemorrhage within the 4th ventricle and surrounding the cervical spinal cord. CTA revealed an extracranial PICA aneurysm located at C1-C2 which was confirmed with a conventional angiogram. 5 days after admission, embolization of the aneurysm was attempted but aborted due to tortuous access and PICA anatomy precluding distal catheter positioning. During a later attempt, using a triaxial approach, the aneurysm was embolized with microcoils resulting in subtotal occlusion and preservation of distal PICA flow.

Results: Upon 3-month follow-up, the aneurysm was completely occluded with a fully patent PICA. The patient's clinical status and neurological exam remained stable.

Conclusion: Extracranial/intradural PICA aneurysms are extremely rare and may present a challenge in management, which has been generally addressed with clipping of the parent vessel. Successful endovascular occlusion of the aneurysms and the parent artery has been reported only once so far. To the best of our knowledge, this is the second documented case of endovascular treatment for an extracranial PICA aneurysm and the only case with preservation of distal PICA flow.

0192
Stent-Assisted Coil Embolization for Ruptured Vertebral Artery Dissection

T Ueno, Y Naito, K Nishiyama, T Shinohara, T Nakagomi

Department of Neurosurgery, Teikyo University School of Medicine, Japan.

Background: It is controversial to use an intracranial stent to assist coil embolization for ruptured dissecting aneurysm. In Japan, Enterprise VRD and Neuroform EZ are the intracranial stents available, which are not approved for use in patients with subarachnoid hemorrhage or dissecting aneurysm. However, we occasionally encounter the cases of ruptured vertebral artery dissection that cannot be treated without stent-assisted technique due to certain anatomical limitations.

Methods: We retrospectively reviewed the cases of ruptured vertebral artery dissection treated by endovascular surgery with assistance of Enterprise VRD. Enterprise VRDs were used totally in 38 cases (7 males and 31 females). Among them, 5 cases were the patients with subarachnoid hemorrhage due to rupture of vertebral artery dissections (WFNS Grade IV: 4 cases, Grade II: 1 case). Conventional internal trapping of vertebral artery dissection was considered to accompany a high risk because contra-lateral vertebral artery was hypoplastic in two cases and posterior inferior cerebellar artery originated from dissecting portion in four cases.

Results: No complications were observed in all cases. All the patients were discharged home with no deficits.

Conclusion: Stent-assisted coil embolization for ruptured vertebral artery dissection can be an alternative option if other surgical or endovascular treatments seem to accompany a high risk.

0196
Endovascular Treatment of Isolated Dissecting Aneurysm of the Posterior Inferior Cerebellar Artery

YK Ihn[2], BH Lee[3], MS Kim[4]

[2] St. Vincent's hospital, Korea. [3] Chungmu hospital, Korea. [4] Eulji university hospital, Korea.

Purpose: Isolated dissecting aneurysms of the posterior inferior cerebellar artery (PICA) are rare, but have a high risk of re-bleeding. We report *Results:* of various endovascular treatments in patients with isolated PICA dissecting aneurysms.

Methods: Nine patients (mean age: 43 years, range: 15-58, M:F=4:5) with isolated PICA dissecting aneurysms were treated by endovascular techniques (graft stent insertion in three, coiling of aneurysmal sac in four, and occlusion of parent artery by coil in two) between March 2007 and May 2012 and followed for up to 45 months. Clinical presentations were acute subarachnoid hemorrhage in five patients, ischemia in two, severe headache in one and an incidental aneurysm of PICA in a ruptured anterior choroidal artery aneurysm. Preprocedural occlusion test performed in five patients.

Results: On immediate angiograms, dissecting aneurysms were successfully occluded in all patients. PICA flow was well preserved in seven of nine patients by collaterals and sluggish PICA flow in remaining two with parent artery occlusion. One patient developed ipsilateral PICA territory infarction two days after parent artery occlusion, but fully recovered at discharge. There were two procedure-related thrombo-embolic complications. Follow-up angiograms showed total aneurysmal occlusion with well preserved PICA flow by collaterals in all patients. There was no newly developed neurologic event or re-bleeding (MRS scale: 0) in all patients during clinical follow-up periods (mean: 40.3month, range: 6-60months).

Conclusions: Various endovascular techniques are feasible and relatively effective, safe treatment modality of the isolated PICA dissecting aneurysm.

0206
The 'One and a Half Round Microcatheterization Technique' for Stent-Assisted Coil Embolization of Intracranial Aneurysm: Technical Case Series

N Matsubara, S Miyachi, T Izumi, T Asai, T Yamanouchi, K Ota, K Oda, T Wakabayashi

Department of Neurosurgery, Nagoya University Graduate School of Medicine, Japan.

Background: Stent-assisted coil embolization is useful for wide-necked, large and giant aneurysms, and is effective for avoiding coil herniation. However, the mobility of the microcatheter is often restricted, resulting in deviated or unbalanced coiling. In order to prevent this insufficient coiling, the authors devised a *Method:* for microcatheterization, the 'one and a half round microcatheterization technique'. This technique is based on the formation of a one and a half round loop by the microcatheter along the aneurysmal wall. Furthermore, this technique can be supplemented with the double-catheter technique.

Methods: From July 2007 to May 2013, the authors used this technique for 24 aneurysms in 24 patients (8 men and 16 women; mean age 62.6 years). The one and a half round microcatheterization technique was used alone in 15 cases and was supplemented with the double-catheter technique in nine. The clinical and angiographic results were retrospectively evaluated.

Results: The average aneurysm size was 16.0 mm; 14 aneurysms (58%) were located at the internal carotid artery, 5 (21%) both at the basilar artery and the vertebral artery. Immediate angiographic results showed complete obliteration in 9 aneurysms (38%) and residual neck in 11 (46%), leaving 4 residual aneurysms (17%). This technique was useful and acceptably safe for packing the aneurysmal sac entirely. During an average follow-up of 23.8 months, 10 of the 18 aneurysms (56%) were stable or had improved, although 3 (17%) required retreatment.

Conclusions: The one and a half round microcatheterization technique provides dense coil packing for stent-assisted embolization of large or giant aneurysms.

0218
Presenting the Delta Trial: Does Embolization With Larger Coils Lead To Better Treatment of Aneurysms Trial. A Randomized Controlled Trial Comparing Treatment with 18-Caliber Coils to Standard 10-Caliber Coils in Small and Medium Aneurysms (3-10 Mm).

JS Ghostine, J Raymond

CHUM - Centre Hospitalier de l'Université de Montréal, Notre-Dame Hospital, Department of Radiology, Montreal, Quebec, Canada.

Background: Endovascular treatmentwith platinum coils is safe and effective at reducing hemorrhage of intracranial aneurysms. Unfortunately, it is associated with incomplete occlusion at initial treatment or recurrence at follow-up. The HELPS trial revealed that aneurysms between 2 and 10 mm diameter were more likely to have an improved angiographic and composite clinical outcome when treated with hydrogel-coated coils, inferred to result from higher packing density afforded by hydrogel expansion. The use of hydrogel coils however is associated with technical difficulties related to expansion and limited time for deployment. We theorize that similar results can be achieved by using soft, voluminous bare platinum coils.

Methods: DELTA is a multicenter randomized controlled, single-blind trial comparing 15-caliber coils, to standard 10-caliber coils in patients with aneurysms ≥3 and ≤ 10 mm or recurrent aneurysms of any size. We hypothesize that the use of 15-caliber platinum coils in

these will decrease the proportion of patients that reach the primary endpoint from 33 to 20% at 12 months. The primary endpoint is a composite at 12-month followup of: major recurrence or residual aneurysm, hemorrhage, retreatment (endovascular or surgical), occurrence or progression of mass effect related to the treated aneurysm, morbidity and mortality that precludes follow up. 564 patients will be randomized 1:1 to either group. Adjudication of *Results:* will be done by a committee blinded to treatment allocation in an independent core laboratory.

*Conclusion:*DELTA aims to show that 15-caliber coils are superior to standard 10-calliber coils in the embolization of small and medium aneurysms.

0220
A Mechanical Coil Insertion System for Endovascular Coil Embolization of Intracranial Aneurysms

N Matsubara[1], S Miyachi[1], K Haraguchi[1], Y Nagano[2], H Yamada[3], H Marui[3], A Sano[4], H Fujimoto[4], T Izumi[1], T Wakabayashi[1]

[1] Department of Neurosurgery, Nagoya University Graduate School of Medicine, Japan. [2] Department of Electronic Control and Robot Engineering, Aichi University of Technology, Japan. [3] New Product Development R&D Center, NTN Corporation, Japan. [4] Graduate School of Engineering, Nagoya Institute of Technology, Japan.

Background: Like other fields of medicine, robotics and mechanization might be introduced into endovascular coil embolization of intracranial aneurysms for effective treatment.

It's been already reported that coil insertion force could be smaller and more stable when the coil delivery wire is driven mechanically at a constant speed. There's the difficulty in synchronizing operators' minds and hands when two operators control the microcatheter and the coil respectively. We have therefore developed a mechanical coil insertion system enabling a single operator to insert coils at a fixed speed while controlling the microcatheter.

Method: Using our new system, the operator manipulated the microcatheter with both hands and drove the coil using foot switches simultaneously.

A delivery wire force sensor was used concurrently, allowing the operator to detect excessive stress on the wire. In vitro coil embolization was performed using three methods simple mechanical advance of the coil; simple mechanical advance of the coil with microcatheter control; and driving (forward/backward) of the coil using foot switches in addition to microcatheter control.

Result: The system worked without any problems, and did not interfere with any procedures. In experimental embolization, delivery wire control using the foot switches and microcatheter manipulation helped to achieve successful insertion of coils.

This system could offer the possibility of developing safer and more efficient coil embolization.

Conclusion: Although we aim at total mechanization and automation of procedures in the future, microcatheter manipulation and synchronized delivery wire control are still indispensable using this system.

0223
Nbca Embolization of a Ruptured Thalamoperforator Artery Aneurysm in a Patient Associated Moyamoya Disease

JW Lim, JM Kim, JS Lee

Neurosurgery department Daejeon Sun Hospital, Korea.

Purpose: Unusually an aneurysm is the cause of hemorrhage in patients with moyamoya disease (MMD). We present a case of a ruptured thalamoperforator artery aneurysm treated with n-butyl cyanoacrylic acid (nBCA) embolization in a patient with MMD.

Materials and Method: A 51-year-old female presented with suddenly decreased mentality and left side 3rd cranial nerve palsy. Initial brain computed tomography and angiography showed subarachnoid hemorrhage, both distal internal carotid arterial occlusion and strong enhancing nodule at left side posterior communicating artery. Digital subtraction angiography reveals occlusion at the terminal portion of the both internal carotid artery with development of moyamoya vessels and aneurysm like vascular pouch at left side P1 portion.

Results: A 50% solution of nBCA and ethiodol was injected into the aneurysm. Postembolization angiography demonstrated no evidence of residual aneurysm. There were no procedural complications and at 1 year follow-up she remained neurologically normal. One year follow-up magnetic resonance angiography showed no residual aneurysm.

Conclusion: In MMD associated with intracranial aneurysms, coil embolization was performed for saccular aneurysms whereas endovascular parent artery occlusion with glu was conducted for pseudoaneurysms. The endovascular occlusion of aneurysms on the collateral vessel in MMD with nBCA might be an effective treatment option.

0233
Angiographic and Clinical Result of Endovascular Treatment in Paraclinoid Aneurysms: Single Center Report

ST Kim[1], HW Jeong[2], JH Seo[3]

[1] Department of Neurosurgery, Busan Paik Hospital, Inje University, Korea. [2] Department of Diagnostic Radiology, Busan Paik Hospital, Inje University, Korea. [3] Department of Neurology, Busan Paik Hospital, Inje University, Korea.

Purpose: The purpose of this study was to analyze the immediate and follow up angiographic result and the clinical result of endovascular treatment in paraclinoid aneurysms.

Materials and Methods: From January 2002 to December 2012, a retrospective review of the angiographic and clinical result was performed. 113 consecutive patients with 115 paraclinoid aneurysms were treated with endovascular technique.

Results: 64 aneurysms(55.6%) were treated with basket technique, 16 aneurysms(13.9%) with balloon assisted technique, 33 aneurysms(28.7%) with stent assisted technique and 2 aneurysms(1.8%) with stent only. Immediate angiography demonstrated complete occlu-

sion in 69(60%), remnant neck in 32(27.8%) and remnant sac in 14(12.2%). Basket group demonstrated complete occlusion in 40(62.5%), remnant neck in 18(28.1%) and remnant sac in 6(9.4%). Balloon group demonstrated complete occlusion in 12(75%), remnant neck in 3(18.8%) and remnant sac in 1(6.2%). Stent group demonstrated complete occlusion in 17(51.5%), remnant neck in 11(33.3%) and remnant sac in 5(15.2%). Follow-up image was obtained in 61 aneurysms(53%) after coiling. In complete occlusion group, 33 aneurysms(47.8%) had a follow-up image. Recanalization occurred in one aneurysm. In remnant neck group, 15 aneurysms(46.8%) had a follow-up image. Recanalization occurred in four aneurysms. In remnant sac group, 11 aneurysms(78.6%) had a follow-up image. Recanalization occurred in three aneurysms.

Conclusion: Endovascular treatment is safe,effective and feasible for paraclinoid aneurysm . With stent or without stent, complete coil packing might contribute to the favorable result.

0264
Feasibility Study of Internal Carotid Artery (ICA) Balloon Occlusion Test Prior to Endovascular Treatment of Ophthalmic Artery Aneurysm; as a Preliminary Study for Predicting Alteration of Visual Function after Treatment

BJ Kim, P Jeon, KH Kim, NR Yang, HS Byun

Department of Radiology, Samsung Medical Center, Korea.

Purpose: The aim of this study was to evaluate the usefulness of ICA balloon occlusion test prior to endovascular treatment of ophthalmic artery aneurysm for predicting alterations of visual function after treatment.

Materials and Methods: From August 2005 to December 2012, patients with aneurysm arising from the origin of ophthalmic artery underwent ICA balloon occlusion test prior to endovascular treatment. Hypercompliant balloon was used to occlude ICA on the same side of the aneurysm and common carotid artery (CCA) angiography was then obtained. Communication between branches of the external carotid artery (ECA) and the ophthalmic branch of the ICA was assessed. Coil embolization with or without stent placement was performed only on the patients with preserved collateral flows. Follow-up MR angiography was accomplished 6 months and 1 year after the treatment and visual function test was conducted immediately after treatment and follow-up clinics.

Results: Twenty-two patients with ophthalmic artery aneurysm underwent ICA balloon occlusion test and 20 patients had communication between ECA and the ophthalmic artery. Coil embolization with or without stent placement was performed on the 20 patients. Two (10%) of 20 patients showed occlusion of the ophthalmic artery on post-embolization angiography and the remaining 18 (90%) patients exhibited preserved antegrade ophthalmic flow. Visual function test revealed no significant interval change in all 20 patients.

*Conclusion:*ICA balloon occlusion test was useful to determine whether to perform endovascular treatment of ophthalmic artery aneurysm containing latent risk of sacrificing its perforating branch.

0268
Reconstructive Multiple Overlapping Stent-Assisted Coiling of Various Types of Ruptured and Unruptured Aneurysms in Single Center Experience

MH Rho[2], EC Chung[2], HJ Park[2], YJ Choi[2], SY Lee[2], YS Won[3], SY Kim[2]

[2] Department of Radiology, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Korea. [3] Department of Neurosurgery, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Korea.

Purpose: Coil embolization of wide-necked or fusiform or dissecting aneurysms is challenging and showed frequent recanalization. We evaluated feasibility and mid-term outcomes of various types of complex aneurysms after multiple overlapping stent-assisted coiling.

Materials and Methods: We retrospectively evaluated various types of 27 aneurysms treated by multiple overlapping stent-assisted coiling. Nine aneurysms (33.3%) were dissecting nature, 5 (18.5%) were blood blister like aneurysms, and 12 aneurysms (44.4%) presented with subarachnoid hemorrhage.

Results: Complete embolization was achieved in 21 aneurysms (77.8%), residual neck was seen in 3 aneurysms (11.1%), and residual aneurysm was noted in 3 aneurysms (11.1%). Immediate procedure-related complication was noted in 6 patients (22.2%) including 2 asymptomatic in-stent thrombosis or occlusion and 2 transient right side weakness and decreased mentality. Procedure-related permanent neurologic deficit (Modified Rankin Scale 1 and 5) was noted in 2 patients (7.4 %). Angiographic follow-up (mean follow-up period: 16.4 months) was performed in 18 patients (66.7%). Major recanalization occurred in 2 aneurysms (11.1 %) and minor compaction was noted in 2 aneurysms (11.1%). The 2 aneurysms (11.1%) were improved and the remained 12 aneurysms (66.7%) were stable. The 2 recanalized and 1 remnant aneurysms were retreated with overlapping stent-assisted coiling and showed no recanalization during 36 months

Conclusions: Multiple overlapping stent-assisted coiling was effective and feasible for various types of complex aneurysms and recurrent aneurysms after stent-assisted coiling during mid-term follow-up.

0288
Trapping of Endovascular Microguidewire: a Rare and Serious Complication During Therapeutic Microcatheterization for Cerebrovascular Disease

YD Cho[1], H-S Kang[1], MH Han[1], SH Kim[2]

[1] Seoul National University Hospital, Korea. [2] Cha Hospital, Korea.

Purpose: In coil embolization for intracranial aneurysm with complex configuration, microcatheter ex-

change is sometimes required depending on application of protection devices such as stent. Control of a long microwire during microcatheter exchange is not easy and is the stage of an exchange where small branch injury is apt to occur. We report here the case series of endovascular microguidewire trapping as a rare and serious event complicating microcatheterization.

Materials and Methods: Three instances of microguidewire trapping accrued at two institutions. Details of these events, where neither advancement nor easy retrieval of the microwires was feasible, were well-documented.

Results: In two patients, the mishap occurred in the process of microcatheter exchange, during coil embolization for unruptured aneurysms. The other instance took place during stenting for intracranial arterial stenosis. A specific type of microwire (Transend 300 Floppy) was routinely involved. In two patients, forceful retrieval of entrapped wires resulted in new intracerebral and subarachnoid hemorrhages; but the third patient recovered without further insult, when the wire was simply left in place.

Conclusion: Microguidewire trapping while navigating the distal cerebral vasculature is a risk linked to small branch/perforator injury. Serious complications from forceful removal may be avoidable by allowing implantation of the trapped microwire.

0296
Coil Vs.Clip: Hospital Stay, Procedure Time and Clinical Outcome in the Treatment of Unruptured Intracranial Aneurysms.

T Nakagomi, T Ueno, K Furuya, Y Naitoh, S Asano, J Tanaka, T Watanabe, T Shinohara, A Ogawa, N Fujii, K Nishiyama

Department of Neurosurgery, Teikyo University Hospital, Japan.

Endovascular coiling is being used increasingly as an alternative to clipping for unruptured intracranial aneurysms. The relative benefits of these two approaches have yet fully established. The aim of this study was to compare hospital stay, procedure time and clinical outcome of endovascular coiling vs. surgical clipping in a single center hospital. Retrospective data analysis included 320 aneurysms performed on 292 patients from January 2006 to June 2013. 344 treatments were carried out (coil: n=191; clip: n=153). Length of hospital stay (days), procedure time (min), clinical outcome at 6 months after treatment, using the modified Rankin Scale were evaluated in both groups. The average age of the patients in the endovascular group was 65.0 years, whereas in the surgical group, it was 60.9 years. Most of the patients had anterior circulation aneurysms (294/320). Twenty-five posterior circulation aneurysms were treated by endovascular procedure. The mean size of unruptured saccular aneurysms in the endovascular group was 5.6 mm, whereas in the surgical group, it was 6.4mm. Coiling significantly reduced the length of hospital stay (coil: 7.7 days; clip: 21.1 days). Procedure time was not different in both groups (coil: 200.8 min; clip: 206.3 min). Additional coiling was carried out in 16 aneurysms (9.9%). A change in modified Rankin Scale score of 2 or more at 6 months after treatment was observed in only 1 patients who had endovascular coiling. In our institute, coiling significantly reduced the hospital stay. There was no significant difference in procedure time. Favorable outcome obtained in both groups. Retreatment rate was nearly 10% in the endovasucular group.

0306
Initial Experience with the Versatile Fill Range Coil (VFCTM) as a Filling Coil for the Treatment of Intracranial Cerebral Aneurysms

S Won-Bae[1], J Hae-Woong[2]

[1] Department of Neurosurgery, Gospel Hospital, Kosin University, Busan, Korea. [2] Department of Diagnostic Radiology, Busan Paik Hospital, Inje University, Busan, Korea.

Purpose: The Versatile Fill Range Coil (VFCTM; MicroVention Inc., Valencia Avenue, CA) is the newly designed specifically to enhance filling efficacy by specific structure to consist of several loops and waves. The purpose of this study was to evaluate the packing and treatment advantage of the VFCTM's unique configuration rather than other conventional coils.

Materials and Methods: Clinical data were analyzed retrospectively for 19 consecutive aneurysms for which at least one VFCTM was used in 2012. Follow-up angiography at 1 year was available for 15 aneurysms. Primary outcomes assessed were acute packing density, three-category occlusion grading, and the number of coils required for aneurysm occlusion.

Results: Of 19 aneurysms, 26.3% were ruptured aneurysms and were treated in the acute setting. The mean size of the aneurysm was 6.9mm. Aneurysm embolization with the VFCTM achieved a high packing density (35.75%) and mean number of VFCTM were three. Immediate postembolization angiography showed complete obliteration in 16 (84.2%) of the 19 aneurysms. There were no procedure-related complications with VFCTMs.

Conclusion: VFCTMs present superiorly to achieve the high packing density by their special ability such as space seeking and less microcatheter movement and to be safe, through the small number of patients in this series. Further studies are needed with more patients to compare the angiographic durability of VFCTMs to other coils.

0307
Distally Located Intracranial Arterial Aneurysms in Posterior Circulations, in Ramathibodi Hospital; Pathophysiology, Natural History, Angioarchitecture, Endovascular Therapeutic Options and Clinical Outcomes

P Jiarakongmun, C Kobkitsuksakul, E Chanthanaphak, S Pongpech

INR Section, Department of Radiology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

Purpose, Material and Methods: To review pathophysiology, natural history, imaging, treatment options and clinical outcomes of distally located intracranial aneurysms of posterior circulations, between December 2011 to May 2013.

Major findings: Among 24 cases of distal intracranial aneurysms, 16 cases of posterior circulation aneurysms comprised of 4males and 12females, with age varying between 30-78years old (mean 55years). 15 cases were present with intracranial hemorrhage, and only one case present with seizure. All patients underwent cerebral angiography and attempted endovascular therapy.

Concerning pathophysiology and angioarchitecture, only one case has mycotic aneurysm, whereas 15cases have dissecting aneurysms, and one case has associated abdominal aortic aneurysm. Size of aneurysms vary between 1x3mm to 8x14mm. There are 5aneurysms of PCA, 6aneurysms at PICA, 3 aneurysms at AICA and 2aneurysms at SCA.

Concerning clinical progression and therapeutic results, 3cases were found spontaneously thrombosed, 2cases treated with detachable coils, 11cases were treated with liquid adhesive (NBCA) embolization successfully, and only one case was treated twice. Two cases have complications, and all cases have acceptable clinical outcomes on follow up.

Conclusion: Distally located intracranial aneurysms, are more common in posterior circulations, and female sex predilection. Mostly presentation are intracranial hemorrhage, and most commonly result of intracranial arterial dissections, and only one case has mycotic aneurysm. PCA and PICA are by far more common locations.Endovascular treatment shows good therapeutic results and clinical outcomes, with few minor complications.

0316
Fred Device for Intracavernous Blister Aneurysm Causing Isolated Sixth Nerve Palsy

S Nair, R Beltechi

University Hospital of Coventry and Warwickshire, United Kingdom.

Purpose: In this poster we discuss
1. Anatomy of the 6th nerve and cavernous sinus
2. Describe presentation and clinical findings of 6th nerve palsy
3. Describe various causes/mechanism of the 6th nerve palsy
4. Endovascular treatment option for intracavernous aneurysm

Material and Methods: We describe a 60 year old male patient presenting with a 3 day history of severe left frontal and periorbital headache, diplopia and ptosis of the left eye. The unenhanced CT head showed no abnormality apart from a bony fusion of the left anterior and posterior clinoid process. The CT angiogram and digital subtraction angiogram revealed a blister aneurysm at the left intracavernous carotid artery. The aneurysm was treated with FRED flow diverter device.

Results: The patient was successfully treated. There was no procedural complication. Post-procedure the patient's headache, diplopia and ptosis were completely resolved. The patient was discharged after 48 hrs. The follow up imaging showed complete occlusion of the aneurysm.

Conclusion: Endovascular flow diverter treatment of a blister aneurysm is a well recognised, safe and effective treatment option. This case demonstrates complete recovery of painful isolated sixth nerve palsy in a patient with intracavernous blister aneurysm.

0335
Silent Microembolism on Diffusion-Weighted MRI after Coil Embolization of Cerebral Aneurysms

SY Sim[1], YS Shin[2]

[1] Inje University Seoul Paik Hospital, Korea. [2] Seoul St. Mary's Hospital, Catholic University of Korea, Korea.

Purpose: To investigate the frequency and risk factors of procedure-related thromboembolism on diffusion-weighted imaging (DWI) associated with aneurysmal coil embolization.

Materials and Methods: We prospectively evaluated 39 consecutive patients with a cerebral aneurysm with DWI after coil embolization. All hyperintense lesions on DWI with a drop of apparent diffusion coefficient values were classified into acute thromboembolic infarction (larger than 5mm in maximal diameters, and located in the vascular territory of the parent artery) and silent microembolism (single or multiple tiny dot-like lesion, less than 5 mm). Possible risk factors for thromboembolic events included vascular risk factors, aneurysmal factors, and procedure-related factors.

Results: Hyperintense lesions on DWI were seen in 17 (43.6%) patients and symptomatic DWI positive lesions were four (10.3%). Acute thromboembolic infarction was observed in 7 (17.9%) patients and silent microembolism in 14 (35.9%) patients. Numbers of silent microembolism ranged from 1 to 15 (mean: 2.86, median: 1, standard deviation ±3.74). Silent microembolisms were located at ipsilateral (n=3, 21.4%), contralateral (n=5, 35.7%), bilateral (n=4, 28.6%), and not related (n=2, 14.3%) to the procedure site. Incidences of silent microembolisms were significantly correlated with left side approach (odds ratio, 4.44, 95% confidence interval, 1.08–18.36; P=0.03).

Conclusions: Left side approach may have increased the likelihood of asymptomatic multiple scattered microemboli after aneurysmal coiling procedures. Particular care must be taken in the handling of guiding catheters, especially when proving left side great vessels.

0342
Intracranial Aneurysms and Sickle Cell Disease Anaemia: Description of Aneurysms, Indications of Endovascular Treatment, Complications and Results about 21 Cerebral Aneurysms

S Gallas[1], T Tuilier[1], V Ebrahiminia[2], R Mounier[3], P Bartolucci[4], A Gaston[1]

[1] CHU Henri MONDOR , Department of Neuroradiology, Hospital Henri Mondor, 5[1] avenue du Maréchal de Lattre de Tassigny, 94010 Créteil, France., France. [2] CHU Henri MONDOR , Department of Department of Informatic and stastical logistic, Hospital Henri Mondor, 5[1] avenue du Maréchal de Lattre de Tassigny, 94010 Créteil, France., France. [3]: Department of reanimation and anesthesiology, Hospital Henri Mondor, 5[1] avenue du Maréchal de latter de Tassigny , 94010 Créteil, France., France. [4] 5 Department of Internal medicine , Hopital Henri Mondor, 5[1] avenue du Maréchal de Lattre de Tassigny, 94010 Créteil, France., France.

Introduction: The neurological complications of Sickle cell disease include cerebral infarction and intracerebral haemorrhage with rarely subarachnoid hemorrhage due to cerebral aneurysms.

Materials and Methods: In our department of neuroradiology, which is specialized in Sicckle cell disease, we reported our experience concerning management of adult's patients with cerebral aneurysms. We identified 20 patients from 18 to 65 years old, with 41 cerebral aneurysms confirmed at digital substract angiography. All patients with neurologic vasculopathy or Moya Moya disease were excluded of this cohort.

Results: Only 14 patients, with 22 aneurysms were treated by endovascular approach for their cerebral aneurysms. No patients were treated by surgical way in our institution. 55 % of patients had multiple aneurysms. Main location of theses aneurysms was latero basilar location. One patient was treated in emergency (day 1) due to subarachnoid haemorrhage with initial good outcome and good *Results:* at follow-up.

Patients had received exchange transfusion before endovascular treatment to reduce the proportion of HbS to approximately 30%.

Two procedure-related complications occurred during the treatment: one thromboembolic event with good outcome of patient after thrombolytic and one aneurismal perforation with death of patient.

Hypercoagulability and risk of thrombosis are major specific risk of this disease and use of permanent device as stent of flow diverter should be discussed to avoid complication.

Conclusion: Endovascular management of these aneurysms seems to be more difficult than in global population, with a higher rate of complications due to hypercoagulability.

0476
Clival Subdural Hematoma Caused by a Posterior Inferior Cerebellar Artery Dissecting Aneurysm

N Gadgil, SH Gopinath, M Khan, G Benndorf

Baylor College of Medicine, United States of America.

Purpose: Dissecting aneurysms of the posterior inferior cerebellar artery (PICA) are rare lesions that typically present with subarachnoid hemorrhage or ischemic symptoms. We report the unusual case of a patient with rupture of a dissecting PICA aneurysm who presented with a clival subdural hematoma.

Material & Method: A 64 year-old female presented with sudden onset of severe headache and neck pain associated with nausea and vomiting. A CT scan was performed which revealed only a minimal subarachnoid hemorrhage and a 7.5 mm subdural hematoma along the lower portion of the clivus effacement of the premedullary cistern and some mass effect on the spinal cord. Cerebral angiography was performed which revealed an extradural origin of the left PICA and a 6 mm dissecting aneurysm with high-grade focal stenosis proximal to its origin.

Results: Endovascular treatment was performed the next day using 6 detachable platinum deployed within the aneurysm while keeping the PICA patent. The patient's post-operative course was uneventful, clinical and angiographic FU showed persistent 90% occlusion and partial healing of the dissection.

Conclusions: Dissecting aneurysms of the PICA are extremely rare and may have an unusual presentation due to the immense anatomical variability of this vessel and should be considered in the differential diagnosis of subdural hematoma. Selective pseudoaneurysm coiling is a viable treatment option for these lesions, though close follow-up is mandatory.

0489
Pericallosal Artery Aneurysms: Treatment and Results

LJ Haas, VHT Boer, LRGO Mello, CIC Bernardes, D De Lara, MR Lang, LE Bonadio, F Cabral

Hospital Santa Isabel, Brazil.

Introduction: Pericalosa artery aneurysms are rare vascular malformations and have great potential morbidity and mortality, particularly in elderly patients or in poor clinical and neurological conditions.

Material and Methods: During the period from October 2005 to May 2013, 21 patients with pericallosal artery aneurysms were treated by endovascular this service, using techniques and materials combined (stents, platinum coils, balloons).

Results: In the study of service corresponded to 2.55% of the total of 818 aneurysms treated with endovascular technique. The mean age of patients was 53 years (29-83 years), female predominance (71.4%). The type saccular corresponded to 80.9% and in 19 cases small and large in both cases. Were treated 8 cases of incidental aneurysms and 13 ruptured aneurysms. These 7 had ruptured aneurysms Fisher III to IV, and 3 patients had intracranial hematoma. The clinical presentation of the Hunt-Hess scale was IV in 2 patients. The clinical or angiographic vasospasm was observed in 8 cases (61%). Three patients died due to severe vasospasm, progressing to brain death. There were no complications in incidental aneurysms.

Conclusions: In 2002 ISAT (International Subarachnoid Aneurysm Trial) endovascular treatment as a first option proved to be superior to clipping in some respects. Since these aneurysms are in the distal position, the improvement of endovascular techniques and materials feasible, even in severely ill patients with a safe and favorable outcomes for these patients.

0490
Posterior Inferior Cerebellar Artery Aneurysms: Treatment and Results

LJ Haas, VHT Boer, LRGO Mello, CIC Bernardes, D De Lara, MR Lang, LE Bonadio, F Cabral

Hospital Santa Isabel, Brazil.

Introduction: Aneurysms of posterior inferior cerebellar artery (PICA) injuries are difficult to treat with conventional surgery and have great potential morbidity and mortality, particularly in elderly patients or in clinical neurological conditions not favorable.

Material and Methods: During the period from October 2005 to May 2013, 23 patients with PICA aneurysms were treated by endovascular this service, using techniques and materials combined.

Results: PICA aneurysms in patients of the service, accounted for 2.8% of the total of 818 aneurysms treated with endovascular technique. Mean age of patients was 55 years (35-79 years), female predominance (82.6%). The most common type of presentation was saccular in 14 cases (60.8%), followed by bilobulado with 2 and 3 with mammillary more fusiform. Incidental aneurysms 9 and 14 ruptured cases. 6 patients had Fisher IV. The scale was Hunt-Hess IV and III in 3 patients in 3 patients. There was a predominance of small aneurysms in 19, 2 large and 2 giant cases. The clinical and angiographic vasospasm observed in 7 patients (50%). The mortality rate was 17.3%.

Conclusions: Considering the complex nature of such injuries and the difficulties of access by conventional surgery, endovascular technique constitutes a safe and effective *Results:* for treating PICA aneurysm.

0499
A Relationship Between Persistence of Embryonic Arteries And Vascular Pathology

R Rivera, R Riveros, JG Sordo, E Bravo, L Badilla, P Giacaman

Instituto de Neurocirugia Asenjo, Chile.

Purpose: To review the association of persistent embryonic arteries with vascular pathology.

Methodology: Cross sectional study. We identified the patients with persistent embryonic arteries diagnosed from 2003 to 2012 in neuroradiology reports. We describe data and use T test to compare the rate of carotid siphon aneurysms between patients with an without persistent arteries obtained from the patients database.

Results: A total of 9720 angiograms were done from 2003 to 2012. We found 39 persistent embryonic arteries, 34 trigeminal, 4 hipoglosal and one otic. The female to male ratio was 1.5. The average age was 49.5 years with a standard deviation of 15.6 years. Pathologies were seen in 38 cases, 35 vascular and 3 tumoral lesions. Of the patients with vascular lesions, 24 were ipsilateral, 12 closely related and 4 cases located in the persistent embryonic artery. Aneurysmal rate in carotid segments C4, C5 and C6 in patients with embryonic ipsilateral artery was 17.7%, compared to 7% of patients without persistent arteries (p=0.0085).

Conclusion: The presence of a persistent embryonic artery is an unusual variant and it may be associated with the development of aneurysms near its origin. Studies with proper methodology are needed to define the risks associated with persistent fetal arteries, but their fulfillment seems unlikely because the low prevalence of these anatomical variants.

0508
Spontaneous Subarachnoid Hemorrhage Secondary To Pituitary Apoplexy

R Rivera, JG Sordo, L Badilla, E Bravo, R Riveros, P Giacaman

Instituto de Neurocirugia Asenjo, Chile.

Purpose: To report a case of subarachnoid hemorrhage secondary to pituitary apoplexy.

Case report: A 53 year old female with a history of hypertension, diabetes and atrial fibrillation on anticoagulant therapy, presented to the ER with acute headache, impaired consciousness and left nerve palsy. Computed tomography showed subarachnoid hemorrhage predominantly suprasellar and a sellar tumor. Day 3 CT showed rebleeding and hemoventricle; CT and catheter angiogram excluded vascular lesions. Sellar MRI demonstrates sellar and suprasellar tumor with apoplexy. Transphenoidal resection where performed without incidents. She presented symptomatic vasospasm treated with combined angioplasty. Patient evolves mRS 5.

Review: The pituitary apoplexy may behave clinically and radiologicaly as aneurismal subarachnoid hemorrhage, with diffuse and massive bleeding and even intraventricular hemorrhage. Additionally may present vasospasm. Among pituitary lesions that may present with apoplexy, are symptomatic and incidental pituitary adenomas, metastatic tumors and inflammatory lesions. Coexistence with ruptured and unruptured cerebral aneurysms had been reported previously, thus angiography is mandatory.

0530
Balloon Test Occlusion and Vessel Sacrifice of a Distal A3 Segment for the Treatment of a Giant Aneurysm: a Case Report

P Klurfan, R Larrazabal, B Van Adel, T Gunnarsson

McMaster University, Canada.

Introduction: Balloon test occlusion (BTO) is a common endovascular procedure for the evaluation of appropriate collateral supply to a distal vascular territory. This method is used to determine the safety of a permanent occlusion for the management of head and neck tumors, giant aneurysm or aneurysm with complex anatomy. BTO is commonly performed in the cervical or proximal intracranial vessels. Literature on test occlusion of small, distal intracranial vessels is limited.

Methods: A 65 y-o male with a mild headache pre-

sented with an unruptured giant 5.8 cm, partially-thrombosed, aneurysm of the distal right anterior cerebral artery (ACA) with surrounding vasogenic edema and mass effect on the left frontal lobe. A well-tolerated BTO of the distal ACA, just proximal to the aneurysm, was performed. The ACA segment was sacrificed with coils with the patient awake throughout the procedure.

Results: The patient had an unremarkable post-operative recovery. His symptoms improved and follow-up MRI showed an interval decrease in size of the aneurysm with no evidence of ischemic insults.

Conclusion: BTO of a small distal terminal branch of the ACA proved to be useful in determining the safety of a permanent vessel sacrifice for the treatment of a giant intracranial aneurysm.

0546
Utilization 3D Fusion Technology for Aneurysmal Coil Embolization

Y Ito, K Kitazawa, H Hasegawa, K Nishino, Y Fujii

Department of Neurosurgery, Brain Research Institute, Niigata University, Japan.

Purpose: Aneurysmal coil embolization requires image of the lesion during procedure. Three Dimensional Rotation Angiography (3D-RA) is now essential and cone development of flat panel technology also enables us to get intraoperative cone beam CT provide us additional informations. Material and

Method: 3D-RA and cone beam CT was performed during various situations of Neuro IVR procedure from May 2005. Scan time for cone beam CT was set to 8 or 20 seconds according to the situations. Cone beam CT was performed with diluted contrast medium to get precise vascular information.

Result: a) Using cone beam CTA, neck information was better visualized compared to 3D-RA. Cone beam CTA was also useful to detect precise position and shape of intracranial stents. b) Relation of intracranial stent and parent vessel, aneurysm was well visualized before coiling. After coiling, this information is limited because of metal artifact of coil mass. Utilization of fusion of stent image of cone beam CT before coil placement and 3D RA after coil placement enables to visualize precise image of stent and coils without metal artifact.

Conclusion: 3D fusion technologies could be essential modality to achieve more accurate and safe neuroendovascular therapy.

0550
Anesthesiology Management in Neuroendovascular Treatment, 20 Years Experience

A Muro, A Ferrario, R Ceratto, C Ingino, R Romero, G De La Rosa, J Vila, P Lylyk

ENERI-La Sagrada Familia, Argentina.

Introduction: The aim of this study was to report the anesthesiology *Method:* used in cerebral endovascular interventions.

Methods: Anesthesiology *Method:* applied in patients undergoing endovascular treatment from January 1992 to June 2013 in the service of endovascular surgery were assessed. Neuroleptoanalgesia and General Anesthesia were evaluated.

Results: Since January 1992 to June 2013, 27.770 patients were treated: 15.400 were diagnostic angiography while 12,370 were endovascular surgery. Neuroleptoanalgesia was the first technique used. From 1996 general anesthesia was the treatment of choice.

Conclusion: Neuroleptoanalgesia allowed mantein an awake patient, who responded to the call and hemodynamically stable. The technological advances in recent years and the development of safer anesthetic techniques led to prioritize the image quality, leading for general anesthesia technique. Choosing the most appropriate anesthetic technique for endovascular surgery should not be based on the discussion "General anesthesia versus neuroleptoanalgesia", but taking into account each patient's pathology, risk of bleeding, surgical approach, clinical status and risk of death.

5 - Intracranial Stents and Flow Diverters

0031
"Twin Peds" to Treat Complex Aneurysms of the Anterior Communicating Artery

C Sicignano, G Buono, L Delehaye

Neuroradiologia - P.O. San Giovanni Bosco - Napoli, Italy.

Purpose: To report our preliminary experience in the treatment of complex aneurysms of the Anterior Communicating Artery (AcoA) with FD (Flow Diverter) devices, using a non-conventional endovascular strategy.

Methods: We treated 4 patients with difficult AcoA aneurysms by positioning FDs (PED - Pipeline Embolization Device, Covidien) in both Anterior Cerebral Ar-

teries (ACA), as "twins". We therefore named this technique "TWIN PEDs". We use this technique for AcoA aneurysms that are not suitable for simple coiling because of the complex shape, large neck or predictable recanalization. In case of bleeding we coiled the aneurysm and the AcoA too.

Results: No complications were observed despite this technique requires access to both ACA, even in the same procedure and in emergency. Until now procedural results, clinical outcomes and follow-ups are positive.

Conclusions: FDs are relatively new stent-like devices; their high density mesh works smartly sealing off the neck of the aneurysm thanks to the thrombosis and, at the same time, it may safeguard functioning of the normal vessels that are covered. In case of bleeding aneurysms the AcoA may be also sacrificed by coiling it; the occlusion of AcoA is well tolerated, particularly if the aneurysm involves the superior and dorsal wall of the AcoA, because in this condition the perforating vessels for the corpus callosum are already not working. The "TWIN PEDs" technique described above may be considered ancillary to the recent experiences of flow diversion and our short series suggests that it may be useful for selected complex AcoA aneurysms.

0072
Treatment of Cerebral Superior Sagittal Sinus Thrombosis Using the Solitaire FR Thrombectomy Device a Case Report

F Charvát[1], J Lacman[1], T Belšan[1], V Beneš II.[2], J Vrána[1]

[1] Radiology Dept., Military University Hospital Prague, Czech Republic. [2] Neurosurgical Dept., Military University Hospital Prague, Czech Republic.

Purpose: Cerebral sinus thrombosis is a serious, less common pathologic condition which occurs in younger age group, has varied clinical manifestations and its etiopathogenesis contains multiple risk factors – infectious (intracerebral, regional, systemic), noninfectious (local – mainly connected to endovascular and surgical procedures and global – hormone contraception use, coagulopathies, dehydration etc.). The primary treatment of a cerebral sinus thrombosis is anticoagulation.

Materials and Methods: The authors present a case report of a 46 years old man with a small right sided frontal meningeoma, treated by resection in a neurosurgery department. On the eighth day after the operation, the patient started to suffer from headache, vertigo, impaired consciousness and leftsided hemiparesis. CT and MRI showed expansive brain edema and cerebral sinus thrombosis of superior sagittal sinus (SSS). The very same day, an urgent endovascular mechanical embolectomy was performed using coaxially inserted 8F and 6F guiding catheters and a Solitaire FR 6/30 stent. The patient was then anticoagulated for 3 months.

Results: The stent was deployed in SSS and withdrawn two times. A large quantity of thrombi was removed and a complete recanalization of the sinus hes been achieved. Patient's headache receded and his neurological impairment has quickly resolved. *Conclusion:* Endovascular treatment is advised in cases when patients' neurological condition is not improving even after sufficient anticoagulation. Mechanical embolectomy can be then a promising treatment option.

0132
Flow Diverters to Treat Bifurcation Aneurysms: Our Preliminary Experience

C Sicignano, G Buono, L Delehaye

Neuroradiologia - P.O. San Giovanni Bosco - Napoli, Italy.

Purpose: To report our preliminary experience in the treatment of intracranial bifurcation aneurysms using Flow Diverter (FD) devices.

Methods: The procedure consists of positioning a FD (PED, Pipeline Embolization Device - Covidien, in this series) from the parent vessel to the main branch beyond the bifurcation, covering the neck of the aneurysm and the origin of the distal vessels. We use this technique for aneurysms not suitable for simple coiling, because of the presence of a branch arising directly from the sac and the wide neck. Until now we treated 11 patients with complex bifucartion aneurysms of the Middle Cerebral Artery (MCA, 6 patients) and of the Anterior Cerebral Artery (ACA, 5 patients).

Results: One minor stroke was observed in a patient with complex anatomy of MCA for which we need to use two FDs, one inside the other, to solve the proximal migration of the first device into the aneurysm; so you cannot consider this as a normal procedure and the ischemic complication may be ascribed to the bilayer of the mesh; however the exclusion of the aneurysm was achieved. In spite of this case the iconographic and clinical follow-ups are positive for the other patients.

Conclusions: FDs are able to influence the blood flow resolving the wall pathology (particularly the aneurysm) by the progressive thrombosis; the experience acquired using FDs make us learned that small perforating arteries continue to work if covered by the mesh and, a fortiori, the main bifurcation vessels are preserved, also if arising from the aneurysm; from this derive the possibility to use FDs for selected and complex bifurcation aneurysms. This could be considered a short but encouraging series.

0168
Interest of a Stent-Dedicated Rotational Angiography to Evaluate the Accurate Deployment of Flow-Diverter Stents

J Gabrieli[1], F Clarençon[1], F Di Maria[1], L Le Jean[2], J Chiras[1], N Sourour[1]

[1] Department of Interventional Neuroradiology. Pitié-Salpêtrière Hospital. Paris VI University, France. [2] Department of Neuroanesthesia. Pitié-Salpêtrière Hospital. Paris VI University, France, France.

Purpose: One of the major drawbacks of Flow Diverter stents (FDS) is their poor radiopacity that may lead to misdeployment with potential severe clinical consequences.

The purpose of this study was to investigate the interest and clinical impact of a stent-dedicated rota-

tional angiography (RA) to evaluate the deployment of the FDS.

Methods: In our institution from January 2009 to April 2013 a consecutive series of 47 patients (mean age 50y, age range 20-77y, 34 females) underwent implantation of at least one FDS. Forty-two unruptured aneurysms, 6 ruptured aneurysms and 1 carotid-cavernous fistula were treated; all patients were operated under general anaesthesia. In 88% of the cases (43/49) a RA (AXIOM Artis dBC – Siemens, Erlangen, Germany) was performed, just after the stent(s) deployment. The acquisition protocol was as follows: intraarterial injection in the parent vessel of iohexol 300 mg I/mL diluted at 20% with saline, coupled with a flat-panel rotational acquisition of 217° rotation and 1 acquisition/0.4°. Imaging was reconstructed on a dedicated workstation (Artis Workplace – Siemens, Erlangen, Germany) and analysed with the aid of multiplanar and maximum intensity projections.

Results: In 2 cases (5%) the RA prompted the operator to perform an additional intra-stent angioplasty for a condition that was previously underestimated.

No patient had thrombo-embolic event related to stent misdeployment. Plavix resistance led to a thrombo-embolic event in one patient.

Conclusions: A dedicated RA may help to depict FDS misdeployment encouraging the operator to perform intra-stent angioplasty (5% of the cases in our experience) to avoid complications.

0173
What About Aneurysm Sac Thrombosis at Day 1 after Flow-Diverter Stenting of Intracranial Aneurysms? A Retrospective Case Series

J Gabrieli[1], F Clarençon[1], F Di Maria[1], L Le Jean[2], J Chiras[1], N Sourour[1]

[1] Department of Interventional Neuroradiology. Pitié-Salpêtrière Hospital. Paris VI University., France.
[2] Department of Neuroanesthesia. Pitié-Salpêtrière Hospital. Paris VI University., France.

Purpose: Flow diverter stents (FDS) lead to a progressive occlusion of the aneurysm, however the delay of thrombosis remains poorly known. The purpose of our study was to evaluate the early angiographic outcome of aneurysms treated with FDS.

Methods: Out of 47 patients treated with FDS in our institution between January 2009 and April 2013, 12 patients harbouring 13 unruptured aneurysms, had a control angiography also at Day 1; post-operative (Day 0) DSA was performed in all cases. Ten cases were treated with a single device while 3 were managed with multiple FDSs; 3 cases had also additional coiling. Day 0 and day 1 angiograms were collected and retrospectively analyzed. Day 0 flow modifications were graded as 1-no, 2-minor, 3-major (major corresponding to contrast stagnation at venous phase). Angiograms at Day 1 were instead rated on the degree of aneurysmal thrombosis by 1-no, 2-partial, 3-complete.

Results: Among the 3 patients with no flow modification at Day 0 none presented intrasaccular thrombosis at Day 1 and only 1 patient had complete occlusion at long term follow-up.

Among the 7 patients with major flow modification at Day 0, partial thrombosis was observed in 86% (6/7) at Day 1 and those (4/7) who had 12 months follow-up showed complete aneurysmal thrombosis.

It is noteworthy that the 3 aneurysms treated with additional coiling, had at least a partial thrombosis day 1 and subsequently progressed to complete thrombosis.

Conclusions: Despite the limited case number it seems that Day 0 contrast stagnation at venous phase is a predictor of partial thrombosis at Day 1; similarly partial thrombosis at Day 1 seems more likely to progress to a complete thrombosis at long-term.

0208
Stenting of Symptomatic Basilar Artery Stenosis; Long Term Follow-up Results

SH Suh[1], BM Kim[2], KY Lee[1 3], KD Suh[3]

[1] Radiology, Gangnam Severance Hospital, Yonsei university, Korea. [2] Radiology, Severance Hospital, Yonsei University, Korea. [3] Neurology, Gangnam Severance Hospital, Yonsei university, Korea.

Purpose: Our aim is to evaluate the long-term *Results:* of stenting in symptomatic basilar artery (BA) stenosis.

Patients and Methods: Thirteen patients with symptomatic BA stenosis (more than 70 % stenosis) were enrolled in this study (male:female = 8:5, mean age = 67.4 years old). In all patients, there were recurrent episode of ischemia despite the antiplatelet medications. Clinical data and angiographies were retrospectively reviewed during 6 years.

Results: Stenting was successful in 12 patients (92%) and one patient had only angioplasty after failure of stenting due to vessel tortuosity. One major complication after stenting was perforator infarction and two patients had asymptomatic hemorrhage on thalamus. Angiographic follow-up was available in 10 patients (77%) for 1 to 100.5 months (mean, 20 months). All patients remained asymptomatic except one patient (8%) with permanent morbidity during the follow-up period.

Conclusion: BA stenting may be an alternative in symptomatic patients with recurrent ischemic symptoms, though their procedural risk is high.

0301
Endovascular Treatment of Complex and Wide Neck Aneurysms of Ophtalmic Segment of Internal Carotid Artey with Flow Diverter Device Pipeline

T Seruga, M Rakusa, M Jevsek

Univercity Clincal Center Maribor, Slovenia.

Introduction: Treatment of big and giant aneurysms is still a challenge in interventional endovascular procedures. Flow diverting could be a promising *Method:* in therapy of this complex illness of arterial vessel wall.

Methods and Material: Principe of flow diverting devices is based on the high density mesh stents which slow down the flow in the sac of aneurysm and induce thrombosis. We treated 12 patients with complex and

wide neck aneurysms of internal carotid arteries, mostly located at the ophthalmic segment of the artery. Central part of device was deployed over the neck of the aneurysm. After the deployment there was still some filling of the sac but already with initial stagnation.

Results: Angiograms six month after the procedure showed still filling of the aneurysms in some cases. In follow up we used contrast enhanced magnetic resonance angiography at 3 Testa field. We did not have complications in terms of vessel dissection, perforation or thromb-embolic incidents. We had some problems in achieving full alignment of device to vessel wall.

Conclusion: Initial results of clinical follow-up of patients in our series are encouraging. Technically intervention was somewhat challenging in some patients with tortuous arteries, so the improvement of the method could be in higher flexibility of the delivery system.

0302
Pconus Assisted Coiling in Emergency: One Case Report

C Sicignano, G Buono, M Ferraioli, L Delehaye

Neuroradiologia - P.O. San Giovanni Bosco - Napoli, Italy.

Purpose: Here we report a case of intracranial aneurysm treated by stent assisted coling, using the pCONus device, in emergency.

Methods: Twelve hours after SAH (Sub-Arachnoid Haemorrhage) a 41 years old male patient was examined by CTangio and DSA (Digital Subtraction Angiography) that showed an aneurysm of the connection of the left A1-A2-ACoA (Anterior Communicating Artery); the aneurysm was showing also a wide neck and a dismorfic bleb. In addition, the patient had intracranial vascular variations of both ACAs (Anterior Cerebral Arteries), i.e. large fenestration and hypoplasia of the right A1 segment, trifurcation of ACA in three A2 branches, not relevant stenosis of the left A1 in corrispondence to another tiny fenestration. The endovascular treatment was done in the same procedure: one pCONus stent was positioned in the left A1 creating a base at the level of the neck; then the coiling was performed.

Results: Exclusion of the aneurysm. No procedural complications. Good clinical outcome; as with stents, antiplatelet therapy followed the procedure,

Conclusions: Bifurcation aneurysms often require complex assisted coiling technique with one or more balloons or stents, increasing the procedural risks. The pCONus stent improves the coiling in case of bifurcation aneurysms – even if wide necked – defending the parent vessels by migration and protrusion of coils. In selected cases and depending on the anatomy - such as in the case reported here - it may work better than balloons and Y stenting technique, in a single device. You can also recapture and/or reposition it. To our knowledge, this is the first report of pCONus assisted coiling in emergency of an ACoA aneurysm.

0365
Traumatic and Spontaneous Vascular Lesions Treatment with Stent Graft Placement: Our Experience with Mid-Term Follow Up

F Villasante[1,2], J Baccaro[3], J Botello[1,2], A Aguado[1,2], EA Vazquez[1,2], P Galván[1,2], A Ceciliano[1,2]

[1] Hospital Alemán - Ciudad de Buenos Aires, Argentina. [2] Hospital Universitario Austral - Pilar. Buenos Aires, Argentina. [3] Instituto de Cardiología de Corrientes. Corrientes, Argentina.

Introduction: In the last decade use of stent graft for carotid aneurysm (CA) and extradural complex fistula (ECF) treatment has been isolated described, with successful *Results:* and preservation of the parent artery in the mid-term follow up results. We present our experience with coated stents.

Materials and Methods: Retrospective analysis including 11 patients with AC or ECF diagnosis treated using stent graft. We did clinical and angiographic follow up (median 18 months).

Results: We treated 5 symptomatic ACs and 6 ECFs (5 Carotid Cavernous Fistulas and 1 Vertebro-Vertebral Fistula). All the lesions were immediately excluded from circulation after stent graft placement. In 6 of the 11 patients underwent balloon dilatation after stent. No technical adverse event, including vessel dissection, vessel perforation, or thromboembolism, occurred and in 9 of 11 patients it was found patency of the parent artery at 18 months (1 patient died in the postoperative hemorrhagic stroke and 1 patient was lost monitoring). One patient had a slow contrast material filling (endoleak) into the aneurysm cavity in a mid-term control, so that we tried unsuccessfully to dilate the stent with a balloon, deciding implanting a second stent Graft with total occlusion of the aneurysm.

Conclusions: Stent graft is an effective alternative device for the treatment of extradural lesions, preserving vascular permeability with low complication rate. Anyhow larger scale studies need to be performed to better quantify treatment benefits.

0488
Improvement of Amaurosis Due Giant Ophtalmic Aneurysm after Treatment with Flow Diverter Stent: Case Report

ME Frudit[1], EP Santos Neto[1], JG Caldas[1], P Puglia Jr[1], M Jory[2], DA Bandeira[1], PF Scanapieco Filho[1], CF Saito Filho[1]

[1] University of São Paulo, Department of Interventional Neuroradiology, Brazil. [2] Irmandade da Santa Casa de Misericórdia de São Paulo, Department of Interventional Neuroradiology, Brazil.

Purpose: Treatment of giant intracranial aneurysms is a major challenge for both endovascular and microsurgical technique. The circulatory exclusion of the aneurysm with decreased compressive effect and preservation of vascular patency are ideally treatment goals. The recent *Introduction:* of flow diverters stents (FDS) increased the possibilities of endovascular treatment with improved compressive effect on the visual pathways. Our aim is to present a case of a giant aneurysm of the ophthalmic segment whose presentation was the commitment bilateral visual field that showed significant improvement after treatment with FDS proven by eye exams.

Methods: We describe a case of 38-year-old woman who presented with a slowly progressive disorder of the left visual field, which progressed to involve the whole visual field (both left and right) with amaurosis, due to the compressive effect of giant aneurysm of the left internal carotid artery.

Results: The initial planning of therapy aimed FDS exclusive utilization without the use of coils. However, due to technical difficulties, was chosen by embolization with platinum coils in order to facilitate the passage of distal microcatheter in a second time. After 1 month was deployed FDS SILK®, covering the residual aneurysm neck. The patient had transient worsening of vision after embolization and progressive improvement of visual disturbance 1 month after placement FDS proven by perimetry.

Conclusions: The use of FDS is an alternative treatment for the group of giant intracranial aneurysms with decreased compressive effect and preservation of the vessel carrier.

0491
Anterior Cerebral Artery Blood Blister Like Aneurym Treated with Stent

R Rivera, JG Sordo, L Badilla, E Bravo, P Giacaman, R Riveros

Instituto de Neurocirugia Asenjo, Chile.

Purpose: To show a case of a ruptured blister like aneurysm from left A1 segment, treated with stenting.

Method: Clinical case report.

Results: A male patient of 45 years old with a history of chronic hypertension difficult to manage, was admitted to our hospital two months after subarachnoid hemorrhage with negative angiogram. New cerebral angiography showed ruptured "Blister Like" aneurysm in left A1 segment. Endovascular management was decided. Neuroform EZ Stent was deployed in front of the neck of the aneurysm. During the procedure occlusive left internal carotid dissection occurred. Angiographic control showed patency of communicating complex. Patient evolved without added complications. Follow-up angiography at 7 months of treatment showed complete occlusion of the aneurysm.

Conclusion: Blister like aneurysms are very infrequent and mainly located in the supraclinoid internal carotid. Other localizations are rare. Stent therapy seems satisfactory alternative treatment of these aneurysms.

0507
The Role of Flow Diverter Stents on Treatment of Dissections of Basilar Artery

ME Frudit[1], EP Santos Neto[1], JG Caldas[1], DA Bandeira[1], PF Scanapieco Filho[1], CF Saito Filho[1], PR Saa[2], ME Ventura[3]

[1] University of São Paulo, Departmento of Interventional Neuroradiology, Brazil. 2 Hospital Salvalus, Brazil.
[3] Irmandade Santa Casa de Misericordia de Santos, Brazil.

Purpose: Dissections of craniocervical vessels have a spectrum of clinical presentation varies from asymptomatic cases to ischemic embolic events, arterial occlusions and subarachnoid hemorrhage. The recent *Introduction:* of flow diverters stents increased the possibilities of endovascular treatment with possibility of vascular reconstruction. We describe two cases of basilar artery dissection with distinct clinical manifestations treated with the placement of flow diverter stents (FDS and favorable outcome.

Methods and Results: Case 1: We describe a case of a 38 years-old-woman who presented with SAH Fisher III, Hunt Hess 3, with digital angiography showing dissection and pseudoaneurysm of upper basilar artery. She was treated in the acute phase with platine coils for remodeling technique and submitted recanalization after 2 months and portrayed with putting colis and displacement of intracranial stent (Neuroform®). Angiographic control after 1 year showed new recanalization and then, it was indicated placing a FDS.

Case 2: We describe a case of a 42 years-old-man who presented with sudden onset of diplopia and dysarthria, presenting on neurological examination left internuclear ophthalmoplegia.

It was diagnosed basilar artery dissection in its middle third with pseudoaneurysm formation, which made compression on the pons. It was then subjected to FDS placement in the basilar artery, with late angiographic control showing exclusion of the lesion and improved symptomatology.

Conclusion: The use of FDS in the treatment of basilar artery dissection with pseudoaneurysms was effective in arterial remodeling and with favorable outcome.

0511
Use of Flow Diverters for Endovascular Treatment of Complex Intracranial Aneurysms

B Lander, M Garcia, A Alonso, A Guimarães, M Alvarado

Venezuelan Central University - Caracas University Hospital, Venezuela.

Purpose: To present the *Results:* of our experience in the endovascular treatment of complex intracranial aneurysms with Flow Diversor Device (FDD).

Materials and Methods: Retrospective study. Thirty (n=30) patients with 34 intracranial aneurysms (23 female, 7 male), mean age 52,1 years old, who underwent endovascular treatment with FDD Pipeline at the interventional neuroradiology unit at Caracas University Hospital (HUC) and Caracas Medical Center (CMC) between January 2011 and June 2013 were included. Aneurysm size, immediate post-embolization changes, clinical evolution and results of angiographic control (6 to 12 months after) were assessed.

Results: 24 wide neck aneurysms (80%), 5 giant (16,6%), 2 pseudoaneurysms, 1 with great wall defect and 1<2 mm were treated with FDD only in 25 patients (83,3%, 35 devices) and FDD + coils in 5 (16,6%). Immediate post-embolization eclipse sign was observed in 23 cases (76,6%), instant disappearance in 6 (20%), no changes in 2 (6,66%) and failure of the device in 1 case (3,33%).

No clinical deficit was reported at subsequent evalu-

ations on 28 patients (93,3%), 2 suffered recurrent SAH and died (6,66%). Angiographic control showed total aneurysm exclusion in 9 cases (30%), sack reduction in 3, eclipse sign in 2, parental artery occlusion in 1 and displacement of the FDD and sac refill in 1 patient, who underwent a second FDD placement with eclipse sign at immediate angiography. 12 patients (40%) are awaiting angiographic control.

Conclusions: In our experience, endovascular treatment of complex intracranial aneurysms with FDD as pipeline *Results:* a technically, accessible, effective and safe alternative.

6 - Arteriovenous Brain and Dural Malformations

0040
A Case of Direct Cavernous Carotid Fistula Presenting with Subarachnoid Hemorrhage

T Asano[1], T Moriwaki[2], Y Niiya[2], S Mabuchi[2]

[1] Department of Neurosurgery, Asahikawa Red Cross Hospital, Japan. [2] Department of Neurosurgery, Ortaru Municipal Medical Center, Japan.

Purpose: We report a case of direct carotid-cavernous fistula (CCF) presumed to be long-standing and asymptomatic consequently caused fatal subarachnoid hemorrhage (SAH).

Case presentation: A 91-year-old female with no history of previous head trauma and optic symptoms presented acute subarachnoid hemorrhage. Angiography revealed a left direct carotid-cavernous fistula draining only into the contralateral cavernous sinus with leptomeningeal venous reflux and small varix on the pontine bridging vein. The affected cavernous sinus was markedly dilated and there was no septum between the left cavernous sinus and the internal carotid artery. The patient underwent transvenous coil embolization of the intercavernous sinus. The leptomeningeal venous reflux was obliterated and opacification of the varix was diminished.

Conclusion: The past history of this patient and angiographical findings strongly suggest long standing asymptomatic CCF caused SAH.

0056
Time-Resolved Ct Angiography (4D-CTA) with Trans-Catheter Intra-Arterial Contrast Injection for the Analysis of Angioarchitecture of Brain AVM

T Asano, J Sakurai, H Saito, T Kobayashi, S Takebayashi, K Takizawa

Department of Neurosurgery, Asahikawa Red Cross Hospital, Japan.

Purpose: To assess the diagnostic performance of time-resolved computed tomographic angiography (CTA) with transcatheter intra-arterial contrast injection in the analysis of the angioarchitecture of intracranial arteriovenous shunts (AVSs).

Materials and Methods: 4 patients with pre-treatment intracranial AVSs (3AVMs and 1 dural AVF) were included. The patients were examined with a time-resolved CTA using 320-row area detector CT with selective transcathter contrast injection just after the diagnostic conventional angiography.

Result: 4-D CTA was successsfuly obtained in all cases without any adverse event. The three dimesional location of the angioarchitectural component (feeder, shunting point and drainer) of the lesions was clearly depicted in all cases.

Conclusion: Time-resolved CTA with intra-arterial injection can achive shorter bolus length and higher local concentration of the contrast than that with Intravenous contrast administration. We believe this method is useful in the close analysis of the intracranial AVSs.

0076
Endovascular Treatment of Spinal Dural AVM in a Rare Location Supplied by Lateral Sacral Artery

F Charvát[1], D Klika[1], T Belšan[1], V Beneš II.[2], J Vrána[1]

[1] Radiology Dept., Military University Hospital Prague, Czech Republic. [2] Neurosurgical Dept., Military University Hospital Prague, Czech Republic.

Introduction: Spinal dural AV fistula (AVF) is a rare pathology of an unknown etiology. AVFs prevail in the mid to older age and in men (85 %). Symptoms are mainly caused by congestion in the draining vein(s) that reduces spinal cord perfusion and leads to hypoxia. Typical are topical neurological symptoms coherent with the location of the AVF – generally paresis to plegia and alternatively conus medullaris or cauda equina syndromes. Widely accepted means of therapy for these conditions is transarterial embolization.

Material and Methods: A 57-yo patient with 6-month history of lower limb dysesthesias, sacral pains, two months of progressive lower limb paraparersis and re-

cently evolved conus medullaris syndrome has been referred to our institution for further examination. MRI of thoracolumbar spine showed spinal cord edema from D9 to conus and enlargement of the surrounding venous plexuses. DSA demonstrated small dural AVF near left S3 foramen supplied by left a. sacralis lateralis and draining through a large ascending vein into spinal veins at L1 level (dorsal intradural AVF). During the same session the AVF was embolized by Onyx LES.

Results: Successful complete exclusion of AVF with immediate clinical effect was achieved. Patient was verticalized, able to walk unaided, restored sphincter control and showed no new neurological signs. Two days postprocedure the patient was dismissed home.

Conclusion: Dural AVF in an unusual location supplied by left lateral sacral artery has been successfully excluded by transarterial embolization with imminent and significant mitigation of the neurological symptoms that have been limiting patient's self-sufficiency and quality of life.

0097
A Treatment Option for Nontraumatic Adult-Type Dural Arteriovenous Fistula

SK Baik[1], YS Kim[1], SW Lee[1], HW Jeong[2]

[1] Pusan national university yangsan hospital, Korea.
[2] Busan Paik Hospital, Inje Universit, Korea.

Objective: Transvenous coil embolization of the affected venous outlet is the most effective treatment *Method:* for the management of nontraumatic adult dural arteriovenous fistulas (DAVFs). However, such an approach is not always feasible. Here, we discuss nontraumatic adult DAVFs that were treated with transarterial coil embolization of the proximal venous outlet at our facility, and cases previously reported in the literature.

Methods: This study included 8 patients who had undergone transarterial coil embolization of the proximal venous outlet for the treatment of nontraumatic adult DAVFs (4 cases in our series and 4 cases in the literature). All clinical, angiographic, and procedural data were retrospectively collected from medical charts or the literature. The DAVFs were classified according to the venous drainage pattern.

Results: In all 8 patients, occlusion of the proximal venous site of the fistula was possible by using coils through the arterial feeders; this resulted in complete recovery in all patients. The access route for 7 of the 8 cases was the middle meningeal artery, and in 1 case was the meningohypophyseal artery. In all 8 patients, the access artery was relatively smooth, with distal enlargement in the fistula region.

Conclusion: If a distally enlarged feeding artery is observed among the multiple feeding arteries, it suggests the existence of a large fistula and may serve as an access route for transarterial venous coil embolization. This procedure may offer a more effective and safer treatment than other endovascular approaches.

0116
Experiences of Dual Lumen Balloon Catheter in Neurointervention

HW Jeong[1], ST Kim[2], JH Seo[3], TH Lee[4], SK Baik[5]

[1] Department of Diagnostic Radiology, Busan Paik Hospital, Inje University, Korea. [2] Department of Neurosurgery, Busan Paik Hospital, Inje University, Korea. [3] Department of Neurology, Busan Paik Hospital, Inje University, Korea. [4] Department of Diagnostic Radiology, Pusan National University Hospital, Korea. [5] Department of Diagnostic Radiology, Pusan National University Yangsan Hospital, Korea.

Purpose: The aim of this report is to introduce our experiences using new dual lumen balloon catheter in various neurointerventional cases.

Materials and Methods: We retrospectively reviewed 6 neurointerventional cases performed with the dual lumen balloon catheter at the three institutions.The first is usage for balloon test occlusion. The second is using for angioplasty and balloon remodeling technique. The third is usage with Onyx.

Results: In a patient with giant paraclinoid aneurysm, balloon test occlusion was performed using scepter C balloon catheter. For 30 minutes of balloon test occlusion, continous flushing system was used into inner lumen of scepter C balloon catheter without microwire. This may be valuable to prevent thromboembolism for test. In the patient with ACA vasospasm due to ruptured anterior cerebral artery aneurysm, balloon angioplasty was required and enough support for navigating distal lesion was provided by 0.014 inch microwire compared with 0.010 microwire. In case of in-stent balloon remodeling technique for intracranial aneurysm coil embolization, scepter C balloon catheter showed easier trackability and additional support using 0.014 microwire. In patient with traumatic carotid cavernous fistula, fistula ostium was occluded using scepter C balloon catheter, onyx embolization was perfomed successfully. And in case of dural arteriovenous fistula and scalp arteriovenous fistula, Scepter C balloon catheter was acted artificial plug and promoted successful Onyx infiltration. All procedure was successfully performed without any complication.

Conclusion: Scepter C balloon catheter could be useful in various neurointerventional procedures.

0127
Hypoglossal Canal Dural Arteriovenous Fistula: Incidence and the Relationship between Symptoms and Drainage Pattern

BM Kim, JW Choi, DI Kim, DJ Kim, EH Lim

Yonsei University College of Medicine, Severance Hospital, Korea.

Object: The purpose of this study was to evaluate the incidence, radiographic findings, the relationship between presenting symptoms for treatment and drainage pattern, and treatment outcomes of hypoglossal canal dural arteriovenous fistula (HC-dAVF).

Methods: Two hundred thirty-eight patients underwent endovascular treatment for cranial dAVF at a single center over 16 years. The incidence, radiographic findings, the relationship between presenting symptoms for treatment and drainage pattern, and treatment outcomes of HC-dAVF were retrospectively evaluated.

Results: Presenting symptoms requiring treatment

were ocular symptoms (n=4), hypoglossal nerve palsy (n=4), aggravation of myelopathy (n=1), and aggravation of tinnitus with headache (n=1). Hypersignal intensity on source images was conspicuous in all 7 patients who underwent MR angiography. All ocular symptoms and congestive myelopathy were associated with predominant drainage to superior ophthalmic or perimedullary veins due to antegrade drainage restriction. All patients who underwent transvenous coil embolization (n=8) or transarterial NBCA embolization (n=1) improved without recurrence. One patient who underwent transarterial particle embolization (n=1) had a recurrence 12 months post-treatment and was retreated with transvenous embolization.

Conclusion: The incidence of HC-dAVF was 4.2% of all cranial dAVF patients who underwent endovascular treatment. More aggressive symptoms may develop depending on a change of predominant drainage route due to the development of venous stenosis or obstruction over time. Transvenous coil embolization appears to be the first treatment of choice.

0151
Multidisciplinary Treatment of Intracranial Dural Arteriovenous Fistulas (DAVF) with Pulsatile Tinnitus: Single Institute Experience in 18 Cases

S Nair, S Nagaraja, D Rejali, H El-Maghraby

University Hospital of Coventry and Warwickshire, United Kingdom.

Background: DAVF are rare vascular anomalies. There are few reports in literature of DAVF with pulsatile tinnitus.

Objective: To describe the clinical presentation, radiological classification (Cognard classification) and role of multidisciplinary treatment of these intracranial dural arteriovenous fistulas (DAVF) with pulsatile tinnitus.

Method: Review of prospectively collected data of 18 cases with confirmed DVAF and pulsatile tinnitus from April 2009 to April 2012. Radiological classification (Cognard classification) with influence on clinical presentation and treatment modularity.

Patients: 18 patients with mean age 54 (28-72 years) had pulsatile tinnitus with 2 presented with intracranial haemorrhages. Intracranial dural arteriovenous fistulas (DAVF) were confirmed angiographically. 8/18 (44%) were Cognard I & II. 10/18 (56%) were Cognard III & IV with 2/10 (20%) presented with intracranial haemorrhages.

Results: Multidisciplinary treatment was tailored according to Cognard classification and clinical presentation. 4/18 was Cognard I, one underwent endovascular occlusion of DAVF, 2 were observed and one had spontaneous resolution of DAVF & tinnitus and did no require further intervension. 14/18 had cortical venous reflux and underwent treatment, 12/14 had endovascular occlusion and 2/12 had microsurgical excision after failed endovascular occlusion.

Conclusion: Pulsatile Tinnitus is a rare presentation of intracranial DAVF. Cortical venous reflux in intracranial dural arteriovenous fistulas is associated with risk of intracranial haemorrhages and mortality. A multidisciplinary treatment of DAVF is required for management of DVAF and pulsatile tinnitus

0154
AV Fistula Management Via Carotid Access

Luan Nguyen[1], Cuon Tran[2]

[1] Gia Dinh Hospital, Vietnam. [2] University of Medicine and pharmacy of Ho Chi Minh City, Vietnam.

A male patient, 58 years old known seizure for long time and treated by medical drugs. He was never evaluated by MRI or MSCT. He hospitalized due to engraved seizure and has been undergone MRI and enhanced MSCT. There is a huge cerebral AV fistula at left parieto-occipital lobe. He has undergone cerebral agniography and tried to close the fistula, but unfortunately failed at first attemp due to terribly tortuous and kinking feeders. There were no kind of extreme long microcatheter (about more 200cm) to reach a safe point. We tried second attemp by bring introducer via open surgical at left internal carotid artery and used a short guiding catheter (about 65 cm) which we were able to advance microcathter to the target. We have closed two fistula, and successfully reduced flow to drainage veins. His seizure has been improved and reduced using antiepilepsy drugs.

0176
Endovascular Treatment of Vertebral Arteriovenous Fistulae in Neurofibromatosis Type 1

P Gao, M Ye, C He, XL Zhi, P Zhang, HQ Zhang, F Ling

Xuanwu Hospital, Beijing, China.

Purpose: To report rare cases of spontaneous vertebral arteriovenous fistulae (AVFs) associated with neurofibromatosis Type 1 (NF-1), which were successfully treated with endovascular embolization.

Materials and Methods: We reviewed four cases who presented with cervical bruit, radicular pain or cervical myelopathy caused by mass effect. Physical examination demonstrated multiple dermatic neurofibromas or café-au-lait spots. Pathological diagnosis confirmed NF-1. All the lesions were defined as high-flow vertebral AVFs with main feedings from ante- and retro-grade flow in vertebral arteries. The fistulae were occluded both proximally and distally with multidisciplinary modalities, including large coils, glue or balloons. Remodeling or detachable balloons were used to provide flow control and appropriate mixture of glue (Glubran or Onyx) was applied to avoid coil migration after deployment.

Results: Four patients underwent 5 sessions of endovascular embolization altogether. All the fistulae were successfully treated in each session. One patient received two-session embolization because of new fistulae formation de novo 3 weeks following the initial obliteration. Hemodynamic changes and dysplastic vascular conditions in NF-1 may play a role. In all the cases, immediate AVF occlusion resulted in a significant de-

crease in size of mass, with clinical cure in 3 and neurological improvement in 1. No complications were presented. A mean follow-up of 20 months (9-30 months) showed no de novo or recurrent AVFs.

Conclusions: Endovascular treatment with multidisciplinary modalities, is effective and safe in the obliteration of rare cases of vertebral AVFs in NF-1.

0181
Endovascular Treatment of Intracranial Dural Arteriovenous Fistulas with Onyx: A Single Center Experience

B Prstojevic, I Vukasinovic, D Nestorovic

Clinical Center of Serbia, Serbia.

Purpose: Dural arteriovenous fistulas (DAVFs) are pathological arteriovenous shunts within the dura mater of the sinuses. Onyx is a nonadhesive liquid embolic agent, that allows the operator a much greater volume and prolonged rate of the injection, compering with glue (NBCA). We present our experience in endovascular treatment of DAVFs with Onyx.

Materials and Methods: We have performed a retrospective analysis of 26 consecutive patients with intracranial DAVFs who were treated with Onyx-18 as the single treatment technique at our institution between August 2008 and March 2013. Patient age ranged from 17 to 72 years. Distribution of dAVF by Congnard classification was: one group l, 5 group II, 15 group III, and 7 group IV (including one cavernous fistula). Transarterial approach was exclusively used in all the cases but one.

Results: Endovascular treatment was successful in all cases. Immediate post-embolization angiographic studies revealed complete occlusion in 21, and near complete in 5 cases. On follow-up (3-6 month) obtained in 21 patients, 19 showed stable occlusion, one that was near complete occluded was completely obliterated, and one showed recanalisation (patient is still under embolization protocol). None of the patient died. There was no bleeding after embolization. In all patients, previous symptoms completely resolved (paresis, tremor, headache, bruit, ophthalmoplegia and chemosis). At 30 days follow-up one patient had neurological deficit - amaurosis of the left eye GOS 4 (Glasgow outcome scale).

Conclusions: Onyx is a safe and effective liquid embolic agent which facilitates transarterial embolization of DAVF, with low recurrence rate.

0191
Preliminary Experience of Prior Particle Use Right Before Onyx Embolization for Various Neurovascular Malformations (Closing Side-Doors Technique)

JH Shim, DG Lee, JC Park, DH Lee

Asan Medical Center, Korea.

Purpose: Onyx embolization using detachable-tip microcatheters has become popular for the treatment of various neurovascular malformations. However, the technqiue is not completely free from early penetration of the Onyx to the draining veins before hitting the whole nidus or fistular holes. Sometimes the procedure takes significant duration with inadvertent embolization of otherwise innocent side branches. The purpose of this presentation is to present our modified Onyx embolization method which is 'close side-doors technique.'

Methods: Between June 2011 and May 2013, we applied the technique in 8 patients with neurovascular malformations (3 with AVMs, and 5 with DAVFs). In those patients, before embolization with Onyx, we performed particle embolization (PVA particles) via multiple side branches to achieve intentional proximal occlusion leaving only one or limited numbers of major feeder(s) for the whole nidi or fistulas. As a result of prior embolization (closing the side doors) the lesion could have only limited dominant feeders (front doors into the target). Onyx embolization was done only through this residual main feeder(s). We evaluated this technique in terms of feasibility and safety.

Results: Total obliteration was achieved in five of 8 cases and partial embolization was achieved in three followed by radiosurgery. No intra- or peri-procedural complication was observe.

Conclusions: "Closing side-doors technique" was feasible without adding any safety issue for the efficient Onyx embolization for various neurovascular malformations.

0234
Preoperative Embolization of Hemangioblastoma With Onyx: Three Cases Report

WB Seung[1], HW Jeong[2], JH Seo[3], ST Kim[4]

[1] Department of Neurosurgery, Kosin University Gospel Hospital, Korea. [2] Department of Diagnostic Radiology, Busan Paik Hospital, Inje University, Korea. [3] Department of Neurology, Busan Paik Hospital, Inje University, Korea. [4] Department of Neurosurgery, Busan Paik Hospital, Inje University, Korea.

Background and Purpose: Hemangioblastoma is a benign and highly vascular tumor. Excessive bleeding is a known potential complication of resection of this highly vascular lesion. To minimize the possibility of this complication, preoperative embolization can be performed. Purpose of this study is to report three cases of embolization using Onyx for hemangioblastoma in the posterior cranial fossa.

Materials and Methods: A 43-year-old male patient with hemangioblastoma in the right posterior cranial fossa presented with headache without any neurologic symptom. A 53-year-old male patient with hemangioblastoma in the right posterior cranial fossa presented with whirling type dizziness and dysarthria. On conventional angiography, these two patients revealed feeder vessels originated from the right superior cerebellar artery. A 18-year-old male patient with hemangioblastoma also in the right posterior cranial fossa presented with headache. This patient revealed multiple feeding vessels originated from the right superior cerebellar artery and anterior inferior cerebellar artery. In three patients with hemangioblastoma, tumor vessels originating off the right superior cerebellar artery were embolized before surgery using Onyx.

Results: After endovascular treatment in three patients, post-embolization arteriography demonstrated near complete obliteration of the vasculature. Penetration of Onyx into the vein was not visible and there was no adverse event. During resection surgery, the tumors were found to be avascular and easily resected, with minimal blood loss.

Conclusion: We report three cases of preoperative embolization of hemangioblastoma in posterior fossa using Onyx.

0287
Covered Stents for the Endovascular Treatment of a Direct Carotid Cavernous Fistula: Single Center Experiences with Nine Cases

Cho Young Dae[1], Lim Jeong Wook[2], Kang Hyun-Seung[1], Han Moon Hee[1]

[1] Seoul National University Hospital, Korea. [2] Sun Hospital, Korea.

Purpose: The purpose of this study is to describe our experiences with the treatment of direct carotid cavernous fistula (DCCF) with covered stents and to evaluate whether a covered stent has a potential to be used as the first choice in selected cases.

Materials and Methods: From February 2009 through November 2012, nine patients underwent covered stent placement for a DCCF occlusion. Clinical and angiographic data were retrospectively reviewed.

Results: Covered stent placement was performed for five patients primarily as the first choice and in four as an alternative option. Access and deployment of a covered stent was successful in all patients (100%) and total occlusion of the fistula was achieved in eight (89%). Complete occlusion immediately after the procedure was obtained in five patients (56%). Endoleak persisted in four patients and the fistulae were found to be completely occluded by one month control angiography in three. The other patient underwent additional coil embolization by a transvenous approach. Balloon inflation-related arterial dissection during the procedure was noted in two cases; healing was noted at follow-up angiography. One patient suffered an asymptomatic internal carotid artery occlusion noted seven months post-treatment.

Conclusion: Although endoleak is currently a common roadblock, our experience demonstrates that a covered stent has the potential to be used as the first choice in DCCF; this potential is likely to increase as experience with this device accumulates and the materials continue to improve.

0291
Carotico-cavenous fistula: A Pictorial Review

H Patel, S Nagaraja, S Nair

University Hospital of Coventry and Warwickshire, United Kingdom.

Purpose: Carotico-cavernous fistulas (CCF) are an acquired, abnormal communication between the carotid circulation and the cavernous venous sinus. They are classified as either direct or indirect. The clinical findings include pulsatile exophthalmos / proptosis, chemosis and subconjunctival haemorrhage, progressive visual loss and raised intracranial pressure.

In this pictorial review we aim to:
· Illustrate the cavernous sinus anatomy
· Describe the blood supply and types of CCF
· Describe the aetiology, classification and image findings of CCF
· Describe various endovascular treatment options with case illustrations of the various approaches which include transarterial, transvenous and the ophthalmic veins

Methods and Material: e retrospectively reviewed all our cases from Aug 2010 to Dec 2011 which were diagnosed with CCF and treated using an endovascular approach with subsequent clinical and radiological follow up.

Results: 4 cases were identified (3 females, 1 male) within the time frame, with an age range of 46-64 years. All 4 patients were successfully treated using various endovascular approaches and complete exclusion of CCF was acheived in all 4 cases. One patient, although symptom free initially post procedure, developed a right abducens nerve palsy.

*Conclusion:*Endovascular treatment of CCF is safe, effective and provide excellent *Results:* with complete exclusion of CCF. Vascular access may well be achieved working in close relationship with Ophthalmologists and early recognition and diagnosis is key from an Ophthalmology perspective.

0323
Fusion Imaging Using Subtracted and Nonsubtracted Rotational Angiography for the Pretherapeutic Evaluation of Dural Arteriovenous Fistulas

M Okahara, H Kiyosue, S Tanoue, J Kashiwagi, N Hongo, T Kubo, H Mori

Oita University Faculty of Medicine, Japan.

Background and Purpose: The pretherapeutic evaluation of angioarchitecture is essential for the successful treatment of intracranial dural arteriovenous fistulas (DAVFs). This study describes the clinical utility of an imaging technique that fuses 3D subtracted and nonsubtracted rotational angiography for the evaluation of the angioarchitecture of dural arteriovenous fistulas.

Materials and Methods: From May 2010 to June 2013, 21 consecutive patients with intracranial DAVFs (22 lesions) underwent 3D cerebral angiography during pretherapeutic evaluation. 3D fusion angiography images were semiautomatically obtained from a dataset of nonsubtracted and subtracted rotational angiographs of all patients. Multiplanar reformatted images and partial MIP images from non-subtracted rotational angiography and fusion images were evaluated by two radiologists with a particular focus on the visualization of feeding arteries, shunted pouches, and drainage veins.

Results: In 21 of 22 lesions, all evaluated items were well depicted on the fusion images. The 3D fusion angiographic images visualized the feeding arteries and

shunted pouches through or adjacent to the bony structure more clearly than 3D digital angiography. In one patient, the fusion image could not demonstrate the architecture in detail due to motion artifacts. All patients were successfully treated by endovascular techniques without any complications.

Conclusion: 3D fusion angiographic images are useful for the pretherapeutic evaluation of the angioarchitecture of intracranial DAVFs.

0479
Intraorbital Arteriovenous Malformation Treated By Embolization Only

Z Metwalli, ST Lee, ST Yevich, S Harada, G Benndorf

Baylor College of Medicine, United States of America.

Purpose: Orbital arteriovenous malformations (AVM) are rare and can cause exophthalmos, conjunctival injection, visual problems or intraorbital hemorrhage. Management can be challenging and consists of surgical removal with or without endovascular treatment. We report our experience with a complex intraorbital arteriovenous malformation successfully treated with staged transarterial embolization.

Case Report: A 56-year-old woman presented with progressive left exophthalmos and conjunctival injection. Imaging evaluation revealed a high-flow intraorbital AVM. On clinical exam, there was mild proptosis, mild afferent pupillary defect, mild hyperemia, normal vision, and mildly elevated intraocular pressure (25 mmHg). Three staged embolization procedures over the course of two years using N-butyl cyanoacrylate (NBCA) injections were performed.

Results: Initial embolization resulted in 40% occlusion and caused progressive occlusion over 8 months from 40% to 80%. Two subsequent embolizations resulted in complete occlusion of the AVM. Intraocular pressure normalized (14 mmHg) and conjunctival injection and exophthalmos improved. During the course of treatment, the patient developed central retinal vein occlusion associated with progressive vision loss and a residual acuity of 20/100 that remained unchanged.

Conclusion: Endovascular treatment of intraorbital AVMs can be successfully performed in selected patients either preoperatively or as a primary therapy. We suggest a staged approach to endovascular occlusion of the AVM. However, patients must be counseled regarding the risks of endovascular treatment including possible worsening of their vision.

0501
Proximal Sylvian Occlusion with Moyamoya-Like and Microaneurysms

R Rivera, JG Sordo, L Badilla, E Bravo, R Riveros, P Giacaman

Instituto de Neurocirugia Asenjo, Chile.

Purpose: To report 2 cases of ruptured aneurysms in moyamoya like vessels in patients with proximal sylvian occlusion and literature review.

Case Reports: The first case is a 83 year old woman with a history of hypertension and coronary heart disease, which presented with acute headache, impaired consciousness and meningeal syndrome. Computed tomography (CT) showed right sylvian subarachnoid hemorrhage, hemoventricle and hydrocephalus. Angiography showed right M1 occlusion with proximal anastomotic network and poststenotic dilatation. Cerebral angiography showed collateral network from pericallosal and left posterior cerebral arteries with 2 mm pseudoaneuysm distal to the stenosis. The second patient is a 60 years old male, with a history of rheumatic disease and hypertension, who presented acute headache, dysarthria and left hemiparesis. CT showed a right ganglionar hematoma. CT Angiography showed right M1 occlusion. Catheter angiogram showed a steno occlusive disease in proximal right middle cerebral artery, with collateral network from lenticular, anterior and posterior ipsilateral cerebral arteries. In lenticular network we found distal 2 mm aneurysm near the hematoma.

Conclusion: Proximal occlusion of the middle cerebral artery may be associated with moyamoya likephenomenon and may cause intracranial hemorrhage. There are very few cases reported with aneurysms in moyamoya vessel network.

0504
Radionecrosis and Radio Induced Cavernous Angioma in Arteriovenous Malformation Treated with Radiosurgery

R Rivera, P Giacaman, R Riveros, E Bravo, L Badilla, JG Sordo

Instituto de Neurocirugia Asenjo, Chile.

Purpose: To present a clinical case of a patient with cerebral arteriovenous malformation embolized and irradiated, with secondary radionecrosis and radio induced cavernous angioma

Clinical case: 25 years old male with a ruptured left choroidal arteriovenous malformation (AVM) in diagnosed in November 2009 and treated with 3 embolizations, with almost complete exclusion. Case was discussed in multidisciplinary team deciding radiosurgery for the small remnant, which takes place in May 2011. In October 2012 cerebral MRI was performed showing radionecrosis. Prolonged oral corticosteroids were prescribed. Control brain CT January 2013 showed hyperdense lesion in surgical bed. New brain CT in Abril 2013 showed bigger hyperdense lesion. Brain MRI showed progression of radionecrosis and a cavernous angioma. Cerebral angiography showed complete exclusion of the AVM.

Conclusion: The radio induced cavernoma is a rare complication of radiosurgery, especially if they have a rapidly progressive growth, few reports exist in the literature.

0505
Sacral Spinal Dural Arteriovenous Fistula. Report of Two Cases

R Rivera, JG Sordo, L Badilla, E Bravo, P Giacaman, R Riveros

Instituto de Neurocirugia Asenjo, Chile.

Purpose: To report two cases of sacral spinal dural fistulas (sDAVF) treated by endovascular embolization. *Materials and Methods:* Retrospective review of sDAVF managed with endovascular therapy from January 2003 to April 2013. Clinical case report.

Results: We found 23 cases of spinal dural fistulas treated and two were sacral. Case 1. 65 years old male with slowly two years onset of progressive paraparesis. MRI showed dorsal myelopathy and spinal dural fistula was suspected. Angiography confirmed sacral dural AV fistula feeded by left lateral sacral artery, with thin ascending peri medullary drainage. Ethinyl vinyl alcohol (EVOH)-Onyx18 embolization was performed, occluding the fistula. Case 2. 46 years old male with impaired consciousness and meningeal syndrome. Lumbar MRI showed back yuxtadural lumbar hematoma. Spinal angiography showed sacral dural fistula afferented by both lateral sacral arteries with ascending perimedullary drainage. Angiographic embolization was performed with EVOH -Onyx18-, with complete occlusion.

Conclusion: sDAVF are infrequent, difficult to diagnose, with a high degree of physical disability. Endovascular treatment with Ethinyl vinyl alcohol is an effective treatment.

0509

Unruptured Arteriovenous Malformations. Single Center Endovascular Treatment Results

R Rivera, JG Sordo, E Bravo, L Badilla, R Riveros, P Giacaman

Instituto de Neurocirugia Asenjo, Chile.

Purpose: To review the results of endovascular treatment of unruptured AVM.

Methodology: Cross sectional study. We reviewed all unruptured AVMs treated from 2008 to 2013. We describe the *Results:* and we performed a uni and multivariate analysis.

Results: 126 patients were treated. 54.7% were women. The average age was 31.96 years. 40% presented with epilepsy and 37% with headache. 87.8% were Spetzler 1 and 2. 88.8% were lobar, 61.9% had surface drainage. 22.2% of patients had risk factors. 52% were treated with Ethinyl Vinyl Alcohol-EVOH-Onyx ®, 17.6% with histoacryl and 30.4% combining both materials, with a median of 2 sessions. A 39.6% was excluded completely, significantly higher in AVM Spetzler 1 and 2. The size was significantly lower in patients with complete occlusion. We report a 7.1% complication rate. A 15.87% required surgery and 3.25% radiosurgery. 85.6% had a good outcome (mRS 0-2) and 78.4% showed stability or improvement of mRS. Compared with the ruptured AVM, there was found significantly more lobar locations ($p < 0.0001$), higher surface drainage ($p < 0.0001$), fewer risk factors ($p = 0.024$), more use of Onyx ($p < 0, 0001$) and more sessions (0.0008) The only factor associated with functional impairment was the occurrence of complications (OR 18.33).

Conclusions: The *Results:* are comparable to other clinical series. The only factor associated with clinical impairment was the occurrence of complications.

7 - Pediatric Neurointerventional

0051

Transarterial Embolization of a Cervicofacial Hemangioma Associated with Kasabach-Merritt Syndrome (KMS) in a Premature Neonate

YJ Lee[1], HJ Lee[2], DW Park[1], HJ Yi[1 3]

[1] Hanyang unversity hospital, Department of Radiology, Korea. [2] Hanyang unversity hospital, Department of Pediatrics, Korea. [3] Hanyang unversity hospital, Department of Neurosurgery, Korea.

Purpose: Kasabach-Merritt syndrome(KMS) is a rare vascular tumor-related hematologic complication with thrombocytopenia and consumptive coagulopathy. We describe a successful embolizaton of cervicofacial hemangioma in a premature neonate with KMS, which is challenging because of the dangers arising from general anesthesia, fulid over load and technical difficulties.

Materials and Methods: A neonate (prematurely delivered at 33 weeks of gestation) with huge cervicofacial capillary hemangioma underewent endovascular treatment due to intractable thrombocytopenia and consumptive coagulopathy despite corticosteroid treatment.

Results: Right common carotid angiogram showed extensive contrast staining of the mass, fed by hypertrophic internal maxillary artery and facial artery without evidence of arteriovenous shunting. On the 4th day of birth, embolization of external carotid arterial feeders with 250~355 μm poly vinyl alcohol particles was performed under the general anesthesia. Prowler plus microcathter was used for superselection of feeding ar-

teries and 4-F headhunter angiocatheter was used for guiding system. Tumor staining could be markedly reduced after embolization. During the procedure, the use of any fluid materials including saline flushing and contrast media was restricted as small a volume as possible to prevent fluid overload. The coagulation parameters and platele counts became within normal range in a few days after embolization. The mass shrank progressively over the patient's remaining days in hospital and his general condition also stabilized.

Conclusion: Transarterial embolization is feasible, safe, and effective in premature infant with KMS.

0203
Toxicity Assesment and Pharmacokinetics after Melphalan and Topotecan Super-Selective Ophthalmic Artery Infusion

P Taich[1], A Ceciliano[2], E Buitrago[1], F Villasante[2], C Sampor[1], G Mato[1], G Chantada[1], P Schaiquevich[1]

[1] Hospital de Pediatria JP Garrahan, Argentina. [2] Maternidad Suizo Argentina, Argentina.

Purpose: To characterize chemotherapy toxicity after melphalan-topotecan simultaneous super-selective ophthalmic artery infusion (SSOAI) and pharmacokinetics in children with retinoblastoma.

Materials and Methods: Adverse events were evaluated after each chemotherapy cycle. Specifically, hematological toxicities were graded according to international criteria. In a group of 21 consenting patients, plasma samples were obtained after 39 cycles of SSOAI of melphalan (3-7 mg) concomitant to topotecan (0.5-1 mg). Melphalan and topotecan pharmacokinetics was studied using nonlinear mixed effects modeling.

Results: A total of 28 patients received SSOAI melphalan concomitant to topotecan in 69 cycles. The median (range) age and weight at the first cycle was 1.6years (0.75-7.4) and 11.6kg (7.9-30), respectively. Chemotherapy was delivered through the internal and external carotid in 52 and 17 procedures, respectively. Adverse events included 9 grade 3/4 neutropenia, one third cranial nerve palsy that resolved with corticosteroids and one allergy to iodine contrast media. Melphalan pharmacokinetic parameters calculated included clearance: 0.44 L/h/kg; volume of distribution: 0.23 L/kg and for topotecan the parameters were clearance: 0.67 L/h/kg; volume of distribution: 0.53 L/kg. A statistical significant relationship between systemic exposure to melphalan and dosage was recorded ($p<0.05$).

Conclusion: SSOAI of combined melphalan and topotecan at the dosages that were employed in the present study are safe with low incidence of hematological toxicity (13%). Melphalan and topotecan pharmacokinetics was characterized for the first time after concomitant SSOAI administration.

8 - Spinal Intervention

0228
Endovascular Treatment of Spinal Epidural Arteriovenous Fistula

K Oda[1], S Miyachi[2], T Izumi[2], N Matsubara[2], T Asai[2], T Yamanouchi[2], K Ohta[2], H Tajima[2], K Saito[1]

[1] Department of Neurosurgery, Fukushima Medical University, Japan. [2] Department of Neurosurgery, Nagoya University, Japan.

Purpose: Spinal epidural arteriovenous fistula (SEDAVF) is rare in the spinal vascular malformations, and is characterized as draining into an epidural venous plexus and sometimes into the intrathecal venous plexus. We experienced 6 cases with SEDAVF successfully treated with endovascular embolization. Treatment strategy and pitfall is discussed according to the review of previous reports.

Materials and Methods: Six patients with SEDAVF, including 3 females, aged from 25 to 83, (mean 51.7 y.o.) were treated with transarterial selective embolization. They were located in upper cervical in 3 and lumber in 3. According to Rangel-Castilla's classification, 5 lesions were categorized in type A, 1 was in type B1, and 1 was in type B2. The duration of the symptoms ranged from 1 month to 2 years. Liquid adhesive agents (NBCA) were used as the embolic materials in all cases, and coils were concomitantly used in 1 case.

Results: Angiographically complete occlusion was achieved in 1 case. Other 5 cases were subtotally occluded. During the follow-up periods (average 26.8 months), MRI showed involution of venous pouches, either no or diminished high signal intensity in the spinal cord on T2-weighted images, with no findings suggesting residual/recurrent AVFs in all cases. Symptoms completely resolved in 3 patients, markedly improved in 3 patients.

Conclusion: Treatment goal of SEDAVF is to reliably occlude the shunt point in the extradural space. Surgery may be considered as the other treatment option for them. However, if the shunt point is reachable endovas-

cularly, embolization can be selected first as the minimum invasive and acceptably curable methods.

0506
Spinal Angiolipoma Embolization with Vinyl Alcohol Ethinyl (EVOH)

JG Sordo, R Rivera, L Badilla, E Bravo, R Riveros, P Giacaman

Instituto de Neurocirugia Asenjo, Chile.

Purpose: To report a case of embolization of spinal angiolipoma with Ethinyl Vinyl Alcohol-EVOH-Onyx.

Case report: A 61 years male with a T5 tumor with extraxial extension resected in 2010, who presented progressive paraparesis. Spine MRI showed a high T1 signal D5 body tumor with extradural extension and compression of the dural sac. Spinal angiography showed irrigation from left T5 intercostal artery. We proceed to the aforementioned pedicle embolization with EVOH with complete angiographic exclusion. Patient evolved with partial regression of paraparesis. Control MRI shows slight decrease in compressive effect.

Review: Hemangiomas and angiolipomas are a continuum, corresponding to hamartomatous diseases. To date there have been reported two successful cases of endovascular devascularization using EVOH of aggressive vertebral hemangiomas. EVOH treatment of vascularized spinal tumors, can be used as a pre-surgical aid and might be useful as a sole treatment, as in this case.

0527
Radiometric Parameters of the Spine and Efficacy of Percutaneous Vertebroplasty in Treatment of Osteoporotic Vertebral Fractures

AM Netlyukh[1], VN Shevaga[1], AV Payenok[1], VM Salo[2], DV Shchybovyk[1]

[1] Lviv National Medical University named after Danylo Halitsky, Ukraine. [2] Lviv Municipal Emergency Hospital, Ukraine.

Background: Osteoporotic vertebral fractures are common cause of low back pain and inability. Currently technique of percutaneous vertebroplasty (PV) is revised concerning its necessity and safety for these conditions.

Materials and Methods: 29 patients with 34 osteoporotic spine fractures were operated by PV technique. Roentgenmorphometry of vertebrae was performed before and after procedures. Pain intensity was assessed by NRS (numerical rating scale).

Results: Good effect was met on wedge type of vertebral body deformity and pain relief consisted 4,7±0,7 degrees on NRS. On double-impressed deformity pain regress consisted 3,8±0,4 degrees, and on compressive deformity it was 3,3±0,7 degrees on NRS. The severity of spine deformity was other important prognostic factor. Pain relief consisted 4,2±0,4 degrees on NRS than loss of vertebral body height was < 30%, otherwise in cases associated with deformity > 30% pain relief was 3,5±0,9 degrees. Early surgery (within 7 days of symptoms onset) led to 5,5±0,7 degrees of pain relief. Procedure performed between 7th and 30th day led to 4,0±1,0 degrees and after 30th day – to 5,3±0,9 degrees of pain relief.

Conclusions: PV is helpful for immediate pain relief for osteoporotic spine fractures. We noted the tendency that prognosis of PV efficacy should be based on such parameter like type and severity of spine deformity. Better efficacy was noted when patients underwent PV month and later after back pain occurrence with double-impressed or wedge deformity of vertebral body and if its height loss was less than 30% .

0562
Acute Paraplegia Following Embolization of Spinal Dural Arteriovenous Fistula: Case Report

H chengguang

Shanghai Changzheng Hospital, China.

Embolization therapy has been considered as the initial treatment for spinal dural arteriovenous fistul (SDAVF) for some special patient or in some medical institutions due to minimal invasiveness, but complication of embolization remains to be a clinical challenge.

This article reports on a SDAVF patient who had weakness of both lower extremities before embolization and developed complete paraplegia without any sensation, accompanied with total urinary retention several hours after embolization therapy, later confirmed by angiography as fistula recurrence.

The symptoms were relieved gradually after second embolization. The pathophysiology of this patient was also discussed.

9 - Morbidity and Mortality Sessions

0345
Procedural Rupture During Coil Embolization for Unruptured Intracranial Aneurysm – How They Are?

KI Jo, BJ Kim, KH Kim, JS Kim, SC Hong, P Jeon

Samsung Medical Center, Korea.

Purpose: The purpose of this study was to determine the incidence and outcome of procedural rupture during coil embolization of unruptured intracranial aneurysm (UIA) at a single institute and to explore potential risk factors.

Materials and Methods: This retrospective study evaluated 1079 patients who were treated for UIA between January 2001 and May 2013. Procedural rupture was defined as an evidence of rupture during coil embolization or post procedural imaging. We examined patients' medical record including procedure description and image findings.

Results: Eleven of 1079 (1.0%) showed procedural rupture in our data. Ruptured point and time of rupture were evaluated and categorized as following, 2 parent artery rupture during stent delivery, 8 aneurysm rupture during filling stage and 1 unkown. Additional surgical procedure was needed in four cases, three cases of craniectomy with hematoma removal and one case of external ventricular drainage. Two parent artery rupture and 1 aneurysm rupture cases showed poor clinical outcome (mRS >2). But eight cases showed favorable outcome (mRS=0). Location of aneurysm was associated with procedural rupture in this study (Fisher's exact test, p=0.013).

Conclusion: In this study, clinical course of the patients with procedural aneurysm rupture during filling stage may be more benign than previous study. But parent artery injury seems to be more urgent, serious and life threatening condition than aneurysm rupture. Although permanent morbidity rate was not so high, we should pay attention to prevent procedural rupture especially in early stage of coil embolization and anterior cerebral artery aneurysm.

0359
Particle Embolization of Cerebellar and Spinal Hemangioblastomas: Hemorrhagic Complications Of Two Cases

P Gao, M Ye, C He, XL Zhi, P Zhang, HQ Zhang, F Ling

Xuanwu Hospital, Beijing, China.

Objective: Hemangioblastomas (HBs) are hyper-vascular neoplasms in the cerebellum and spinal cord. Preoperative embolization of the feeding arteries has been proposed to reduce hemorrhage and facilitate tumor removal; however, its safety remains controversial in the literature. We reported hemorrhagic complications of two cases after particle embolization. Its pathophysiological mechanisms that cause bleeding are discussed.

Methods: Between 2005 and 2013, 18 patients (8 cerebellum and 10 spine) were treated at our center. All have been referred with neuroimaging evidence and histological confirmation of craniospinal HBs. Particle embolization using PVA or Embosphere (ranging from 100μm to 500μm in diameter) was applied for selected cases.

Results: Embolizations were complicated by intratumoral hemorrhage in two cases: one cervical spine HB during procedure and one cerebellar vermis HB within six hours after procedure. Emergency treatment included endovascular leak occlusion with NBCA and tumor removals. Both of them survived and their neurological function were severely impaired. Large PVA particles (300-500 μm) may account for the spinal HB hemorrhage since PVA are irregularly-shaped and form agglomerates that occlude more proximally. Inappropriate injection may increase intratumoral pressure and rupture fragile vessels. Cerebellar HB hemorrhage could be venous obstruction caused by small Embosphere (100-300 μm) and subsequent heterogeneous congestion of tumor vessels, leading to their rupture.

Conclusion: Along with previous literatures, our data suggested embolization using particles for cerebellar and spinal HBs is associated with high rates of complication.

0386
Remote Cerebellar Haemorrhage: a Case Report

G Lewis, H Patel, S Nair

University Hospital of Coventry and Warwickshire, United Kingdom.

Purpose: Local intracranial haemorrhage is a common occurrence following open neurosurgery. Remote cerebellar haemorrhage (RCH) however is a much rarer complication occurring in up to 0.3% of cases, being reported following both supratentorial and spinal surgery. The pathophysiology is still not completely understood, but most theories point towards venous bleeding secondary to excess CSF loss during surgery. In this pictorial review we will present 2 cases of RCH within our centre and discuss this poorly understood condition.

Methods and Material: A retrospective review was performed and clinical details obtained using the hospital electronic clinical information system and images were obtained. A literature review was performed using the search terms "remote cerebellar haemorrhage" on Medline.

Results: Case 1: A 53 year old female presented via

her general practitioner with a history of migraine and labrynthitis. Initial assessment with MRI demonstrated an intraventricular mass. After neurosurgical debulking of the tumour, the patient deteriorated. Post operative CT imaging demonstrated a left cerebellar haematoma in addition to expected post operative changes.

Case 2: A 56 year old male with previously coiled left posterior inferior cerebellar artery (PICA) aneurysm underwent elective clipping of a left middle cerebral artery (MCA) aneurysm. The patient deteriorated post procedure and had subsequent CT imaging. This demonstrated a RCH in addition to an evolving infarct in the left MCA territory.

Conclusion: Whilst often conservatively managed, RCH should not be overlooked as a cause of patient deterioration following open neurosurgery.

0528
The Case of Carotid Blowout Syndrome with Common Carotid Artery Sacrifice Using Detachable Balloon

T Worakijthamrongchai, S Pongpech, C Kobkitsuksakul

Ramathibodi hospital, Thailand.

Introduction: : Carotid blowout syndrome(CBS) is a high risk for morbidity and mortality that occur in head and neck cancers, radiation-induced necrosis, recurrent tumors or pharyngocutaneous fistulas.

Case: A 51 year-old man, known case of tongue cancer (T2N0M0) S/P wide excision, node dissection and radiotherapy.

He developed skin metastasis at right neck with chronic wound ulcer from post radiotherapy treatment change for 9 months later. He presented with massive bleeding from wound of right neck for 6 hours and hypovolemic shock.

He was resuscitated by blood transfusion, intravenous fluid and manual pressure the wound at right neck zone. The right distal common carotid artery (CCA) pseudoaneurysm 12×9.4 mm. diameter at C4/5 level were immediately identified by angiography. Balloon occlusion test (angiographical evaluation without functional testing) was done using detachable balloon at the right CCA. Contralateral left ICA angiogram showed adequate collateral from the Acom. The left vertebral artery angiogram showed no supply from the Pcom

. The balloon was detached at the right carotid bifurcation following with another balloon just detached below the right CCA pseudoaneurysm. Then control angiogram showed total occlusion of the right CCA.

The active bleeding was stopped and stroke syndrome did not occur. The carotid artery sacrifice using detachable balloon is safty, prevent death and save cost of treatment.

Conclusion: CBS manifests uncontrollable massive hemorrhage from invasion and destruction of the cervical carotid vasculature from head and neck cancer.

The emergency carotid sacrifice using detachable balloon procedure can be performed for lifesaving.